The Community Energy Profile

Ontario

Ministry of Energy

Honourable Robert Welch, Q.C. Minister

This report, prepared for the Ministry of Energy for Ontario, is published as a public service for the information of the public. The Ministry does not, however, warrant the accuracy of its contents and cannot guarantee or assume any liability for the effectiveness or economic benefits of the devices and processes described in the report.

Printed July 1982

The Community Energy Profile

CONCEPTS, METHODS, APPLICATIONS

Prepared by
Reg Lang and Audrey Armour
Faculty of Environmental Studies
York University

for
Ontario Ministry of Energy

March 1982
ISBN 0-7743-7571-X

ACKNOWLEDGEMENTS

Numerous agencies and individuals provided assistance during the study whose results are presented in this report and the draft Guide to Community Energy Profiling. The authors are especially grateful to: Jane Allen, Ministry of Energy, for her overall guidance and support; Mike Meshenberg and Wayne Pferdehirt of Argonne National Laboratory, for giving generously of their time and documentation; Glen Wood of Brampton Hydro, Gord Leonard of Union Gas, and Geoff Milburn, Ian Hope and John Sarple of Consumers' Gas, for helping with questions concerning data availability; for similar assistance, Jim Reynolds of the Ministry of Transportation and Communications, and Gay Cook and Leonard Berk of Ontario Hydro; Dave McCauley and Terry Short, graduate students in the Faculty of Environmental Studies, for undertaking part of the workshop presentation, along with David Berger of the Academy for Contemporary Problems and the various municipal and provincial officials who participated in the workshop; staff of the CCEMP communities who provided documents and other information; and Anne Wilson, of Quality Steno Services, who typed the two reports.

AUTHORS

REG LANG, MCIP, P.Eng., is a Professor in Environmental Studies at York University where he teaches environmental and energy planning and management. He has extensive experience as a professional planner and engineer, administrator and consultant-researcher at all three levels of government and in various parts of Canada.

AUDREY ARMOUR, M.E.S., MCIP, is a consultant whose work, in addition to community energy planning and management, focuses on environmental planning and policy formulation at the local level and environmental/social impact assessment. She teaches impact assessment (part-time) in York University's Faculty of Environmental Studies and is its Coordinator of Non-Degree Studies.

Contents

Introduction. 1

1. CONTEXT 3

Energy Problems and Municipal Responses 4

Municipal Energy Activity Patterns. 6

2. METHODS 13

Concepts. 14

Alternative Approaches. 20

Generic Methods 22

3. APPLICATIONS. 32

Comprehensive Community Energy Management Program . 34

Auditing/Profiling Experience Under CCEMP 38

Importance of the Energy Planning Approach. 46

4. CONCLUSIONS AND IMPLICATIONS. 53

Conclusions 54

Implications. 60

Footnotes 68

Appendix A: Annotated Bibliography on Community Energy Profiling 76

Appendix B: Examples of Community Energy Profiles. . . 84

Appendix C: Study Method 97

Introduction

In July, 1981 York University contracted with the Ontario Ministry of Energy to develop a method for analyzing energy consumption in communities as a basis for devising energy plans. A draft Guide to Community Energy Profiling, submitted to the Ministry in March 1981, sets out that method. This report, the other output of the project, provides background information on concepts and methods of community energy profiling, reviews their application in various jurisdictions, and draws out lessons for Ontario municipalities.

Chapter 1 briefly describes the energy-problem context for community energy planning, of which profiling is one aspect. Chapter 2 focuses on methods; it begins by discussing various definitions of "community energy profile", then presents alternative approaches to profiling together with five prominent generic methods. Chapter 3 is a critical

evaluation of profiling experience under the U.S. Department of Energy's Comprehensive Community Energy Management Program. Chapter 4 draws conclusions from this experience and considers its implications for energy profiling in Ontario communities. General references on profiling and specific examples of community energy profiles, together with the method used in the Study, are presented in the appendix.

1. Context

Community energy profiling is not an end in itself. It is part of a process of community energy planning and management which relates to the broader context of municipal governance. This chapter briefly reviews the municipal response to energy problems, in both Ontario and the United States, the source of most of the experience in the community energy management field. Several patterns, evident in this experience, have relevance for Ontario municipalities and their use of community energy profiles.

Energy Problems and Municipal Responses

Energy prices are rising rapidly. And even in Canada, well-endowed with energy resources, there is the prospect of supply shortages, especially of oil, in this decade. Municipalities are responding to this double-barreled energy problem – cost and longer-run availability of certain energy forms – by attempting to cut energy costs and lessen local dependency on outside sources. Such measures involve reducing energy consumption, making more efficient use of the energy that is consumed, switching to fuels that are cheaper and offer greater security of supply, and developing local energy resources.

The response to energy problems varies from one municipality to another, between different parts of the country, and among countries. In the United States municipal energy action is widespread, mainly as a result of escalating energy prices but also because many areas have experienced supply disruptions since the OPEC embargo of 1973. It is not surprising, therefore, that the overwhelming majority (over 90%) of American cities and counties covered in a recent nation-wide survey by the International City Management Association reported having taken steps to reduce energy costs in their municipal operations; for 59% of the

cities and 43% of the counties, energy expenditures are the second largest item (behind personnel) in their operating budgets.[1]

The picture in Canada is somewhat different. Only recently, since the September 1981 Canada-Alberta agreement, have fossil-fuel prices begun to move toward world levels from the earlier, artificially low, government-subsidized rates. More significantly, Canada has not experienced supply shortfalls (long lineups at service stations, odd-even rationing, rolling brownouts, etc.). Consequently, compared with the USA, this country exhibits considerably less public and political concern over "the energy problem".

Still, increasing energy costs, and obvious opportunities to cope with inflation by saving money through saving energy, have motivated municipal officials toward conservation and substitution, in Ontario and elsewhere in Canada. A 1981 survey of Ontario municipalities discovered a significant degree of energy-related activity, for example. Of the responding municipalities:

- Over two-thirds are keeping records of energy costs in the municipal fleet.
- Over half are restricting urban sprawl and strip development.

- Nearly half are changing over to energy-efficient street lights and vehicles, and almost half of the municipalities with public transit systems are improving the service to make it more convenient.
- About two of every five are introducing energy-conserving features into new public buildings and applying energy management programs to existing public buildings.
- A third have appointed energy coordinators and a similar number are incorporating energy considerations into municipal planning.[2]

Although this activity is encouraging, even the more active Ontario municipalities are still in the early stages of responding to energy problems. As they proceed further, and as other municipalities begin their energy management activities, they can benefit from what has been learned by their counterparts in the United States. Several patterns are evident from that experience.

Municipal Energy Activity Patterns

The first pattern is the tendency for municipal energy concern to be directed initially toward the municipality's

internal operations. The American Planning Association, in a recent survey of energy activities and needs of local governments in six states, concluded, "After communities began to address their internal energy consumption, they began to perceive the greatest needs to exist in the community as a whole."[3] The reasons are fairly obvious. Energy problems are first perceived as cost problems; energy conservation offers numerous opportunities to save dollars and cope with inflation. The mandate to undertake energy conservation can be piggybacked onto the mandate to run local government efficiently. Internal measures usually can be pursued out of the public eye, and many of them are technical in nature – e.g., establishing a computerized system to manage energy consumption in municipal buildings, switching from gasoline to propane-powered vehicles, and using lifecycle costing in municipal purchases (significantly, non-technical measures, such as employee education programs or the behaviour changes involved in operating buses more energy-efficiently, are far less likely to be adopted by municipalities in the early stages[4]).

All of these factors make in-house energy initiatives relatively attractive. By contrast, elected and appointed municipal officials are likely to be cautious about taking actions that facilitate energy conservation in the community

at large. The mandate to do so tends to be unclear and the types of measures to be taken may well be new and unproved. Furthermore, community-directed energy initiatives necessarily involve community interests, have uncertain outcomes and carry an element of political risk.

Yet, the main opportunities to address energy issues lie not within the municipal corporation but in the community at large. In the average community, perhaps 5 to 10% of the total energy consumed is accounted for by the municipal corporation directly. The rest is consumed by industries, businesses, other public and private institutions, people in their homes and vehicles, and the process of energy supply itself. The municipal corporation, though a relatively small energy consumer, can play a pivotal role in unlocking the community's potential for energy conservation, substitution and local resource development. Recognition of this fact and the political will to act on it, however, takes time and experience, which is what the APA study is saying. And while exceptions exist – the City of Davis, California, being a prominent example of community-directed action coming first[5] – the pattern nonetheless holds for the average municipality. In Ontario, for example, few municipalities have proceeded beyond actions aimed at their own operations.[6]

A related pattern is the tendency to begin with no cost/low cost measures, such as audits of public buildings. As experience is gained, the available benefits of energy-oriented action become more apparent and support for such action accumulates. Internal measures involving some public investment but with quick paybacks tend to be done next. Only later does the average municipality tackle the higher-cost initiatives with large, longer-term benefits (e.g., a resource recovery plant). Similarly, community-directed measures with little cost and a high likelihood of public acceptability (for instance, heat-save clinics run by the provincial government) typically precede more complex actions involving the input of public funds, and even these often need pump-priming from outside funding sources. Only after a considerable period of in-house and community-directed experience with energy activities are tough measures, such as the mandatory retrofit ordinances adopted by some U.S. cities, likely to appear.

The third pattern is a tendency to begin in an ad hoc opportunistic manner, pursuing in-house and community-directed measures as they arise, and gradually to move towards a more broadly based, comprehensive and integrated set of initiatives. The APA study makes this point clearly:

> Evidently communities were not planning first, and then taking action – a model frequently urged in manuals and guidebooks. Of the 72 communities that listed five or fewer conservation-oriented activities, only *three* (4 percent) said that they had done a study of local energy supply or demand. Similarly, only three said they had adopted energy policies in their comprehensive plans. However, the proportion of communities undertaking studies and/or planning increased dramatically to around 50 percent of those having taken between 6 and 8 actions. For the communities that have been even more active (9 items or more) virtually all have done studies or plans or both. This may suggest that once a community has begun to address some of its in-house energy concerns, it recognizes the need to take a more systematic communitywide approach. One local energy coordinator stated, "Now that we've tackled a few of the most pressing things, we need to pause and figure out where we're going."[7]

Obviously, there are exceptions to this pattern. For example, the City of Lincoln, Nebraska, and San Diego County, California, both with strong comprehensive planning traditions plus political commitment, have successfully pursued plan-first approaches.[8] Numerous other municipalities have attempted such an approach, with varying degrees of success/failure. Chapter 3, documenting the experience of 16 communities under the U.S. Department of Energy's Comprehensive Community Energy Management Program, underscores the hazards of allowing planning to get too far ahead of commitment and implementation, especially in the uncertain energy field. In Ontario, so far no municipalities have taken a comprehensive approach. There is an emerging trend in that direction, assisted by the

Ministry of Energy and the Ministry of Municipal Affairs and Housing, but its outcome remains to be seen.

TABLE 1.1 MUNICIPAL ENERGY ACTIVITY PATTERNS

	Initially	Later
Focus	In-house Municipal operations	Community-directed
Type of Measures	No cost/low cost Quick payback Easy	Higher cost and benefit Longer payback period Difficult
Approach	Ad hoc Opportunistic	Broadly based, comprehensive Coordinated, integrated

Nonetheless, each of the three patterns, summarized above, displays a kind of logical evolution; one thing tends to lead naturally to another. This is a rational response to a situation where the underlying issues, while vital, are not yet perceived as such by most of the public and their elected representatives. And so, it makes good sense to proceed incrementally, a step at a time, limiting commitments until more is known about the problems and opportunities and until there is more support for action.

Along each of the three continuums, however, a point is reached where common sense, partial information and a short-term viewpoint tend not to be good enough. These are times when key choices must be made – between committing resources to one course of action versus another, where not all options can be pursued and where experimental action is not feasible (it is difficult to build only a bit of a subway, for example). This critical juncture especially tends to occur after a number of the straightforward individual energy initiatives have been put into effect and only the tougher, more expensive, risky measures remain. More then needs to be known in order to decide what to do next and how to take strategic coordinated action where initiatives reinforce each other. At this point there often is a need to step back, take a larger look and learn more about the problem, the options and their inplications before proceeding.

The community energy profile is one such information input.

2. Methods

Municipal officials anxious to respond to energy problems typically are hindered by the absence of basic information.

> Few communities know where the energy that supports them comes from, how it is consumed or where it is wasted. Even less is known about the impact that future price hikes or possible supply disruptions might have on the economy of the community and the lives of its residents. Without this information municipal leaders find it difficult to assess their energy problems and vulnerabilities, pinpoint needs and options, set priorities, develop programs, seek assistance from senior governments and others, generate local support for required action, and monitor progress.[1]

The community energy profile is an important part of the data base that municipal officials require to make sound energy-related decisions. This chapter discusses the main concepts that underpin different approaches to community energy profiling, differentiates the main kinds of methods, and reviews five prominent generic methods (these and others are referenced in Appendix A) that have significantly influenced practice.

Concepts

Because community energy profiling has only a short history – five years at most – differences of opinion exist concerning what a profile ought to comprise and why it should be done (reflecting deeper differences of opinion concerning the nature of community energy planning and management). Even the use of key terms is inconsistent. "Community energy audit" is preferred in the U.S.A. while "community energy profile" is more often used in Canada.

Community energy profiling evolved from energy audits done for buildings, vehicle fleets and other discrete uses; such audits in turn have their roots in financial audits. At the scale of the individual building, or even at the level of operation of a public or private corporation, an energy audit is "simply a study ... to determine where and how well energy is being used."[2] The term "community energy profile" takes this concept further, to the scale of a neighbourhood, an entire community and perhaps even an urban region. A community energy audit/profile has been defined as "a systematic method of collecting data that quantitatively describe a community's energy supplies and demands", the overall objective of which is "to provide the

data base needed for making sound energy-related decisions within a community".[3]

Energy Flows In Brampton

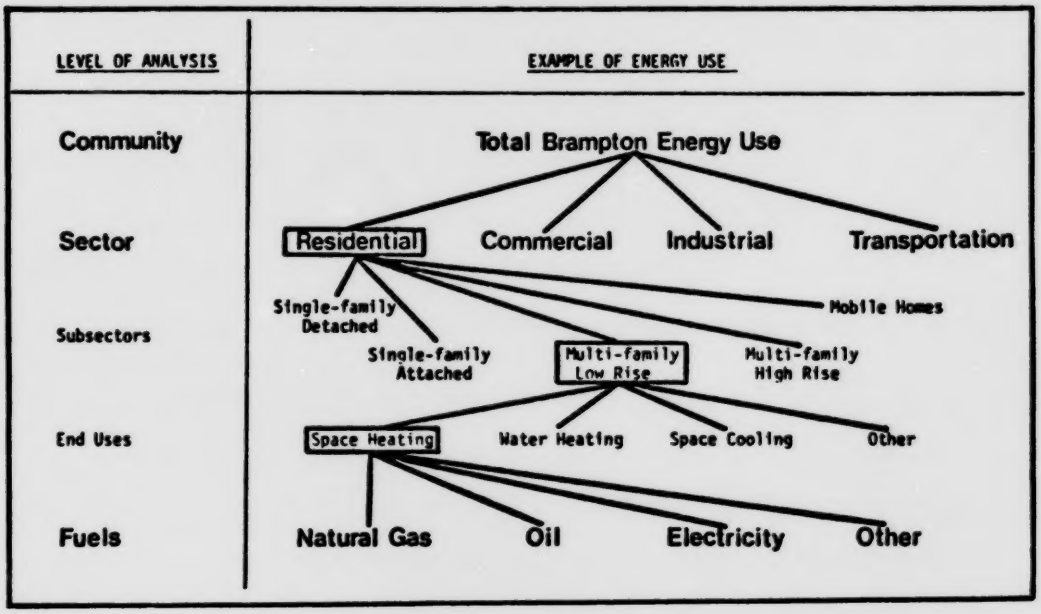

Figure 2.1
Energy Flows in a Sample Community

Community energy profiles can serve a number of more specific purposes including:

- Providing an informative overview of the community's energy supply and demand;

- Identifying the community's main energy problems and opportunities;
- Providing data that will assist in estimating the energy implications of policy and program options as well as the energy costs and savings of specific proposed measures;
- Creating a benchmark of data against which the results of implemented programs can be monitored and evaluated; and
- Educating the community at large, focusing public attention on energy issues and raising public awareness.

A specific community energy profile may not serve all of the foregoing purposes, or it may achieve them only over an extended time period. An overview profile, for example, might require no more than a rough approximation of the local energy picture, whereas a benchmark capable of detecting small changes in energy consumption would have to be quite accurate. This exposes a primary point of contention: the range of content (scope) and level of detail (specificity) appropriate for a given profile. Experience documented in Chapter 3 indicates that defining scope and specificity are key matters of judgement in the

initial stages of a community energy management process, and that such judgements are quite difficult to make.

Choices related to scope and specificity include:

- Which fuels (heating oil, natural gas, electricity, gasoline, etc.) and which sectors (residential, commercial, industrial, transportation) to focus on; sometimes for instance, the industrial sector is omitted from the first cut of a community energy profile.
- Whether to include subsectors of some or all of the sectors; e.g., it may be desirable to break the municipal government subsector out of the commercial sector, or to divide the residential sector into single detached, attached and multiple units.
- Whether to include end uses; if consumption of oil is a problem, for example, it may be necessary to examine space heating.
- Whether to look back (trends) and/or ahead (projections) with respect to community energy consumption patterns.
- Whether to include the supply side; most community energy profiles to date have been limited to demand/consumption.
- What level of accuracy of data is needed.

These choices reflect a basic principle: data should serve clearly identified purposes. When these are not externally defined and decisions of what to look for and how far to go are left to the individuals gathering the data, they are more guided by their professional sense of what constitutes a sound data base, their perception of decision-makers' needs and their intellectual curiosity, as well as by the usual constraints of time and budget. When the subject is as pervasive as energy, the result can be (and has been) profiles that contain much useless information and consume the lion's share of scarce resources.

Additional considerations of scope have to do with the overall approach taken to community energy planning and management. Two broad approaches have emerged: the single community energy profile and the staged or iterative profile. The former conforms to the classic view of comprehensive planning, encompassing (to the extent that available resources permit) all factors bearing on the community's energy supply and demand; it assumes that a comprehensive data base is a necessary prerequisite to sound planning. The alternative approach proceeds in stages, e.g., a macro stage first, to pinpoint questions that can be the focus for a more intensive data search in the micro

stage that follows. Or it proceeds in iterations, covering all or much of the community's energy picture roughly in the first round, feeding this information to decision-makers for preliminary choices to be made, then focusing the next round on this narrower field of inquiry, and so on. It is apparent that a single community energy profile would have much greater scope and demand a higher degree of accuracy than a staged or iterative profile.

After the decision concerning overall approach has been made, another question of scope remains: how far should the profile penetrate the planning process? Building audits face a similar choice; some of them merely describe energy use while others go further to diagnose energy problems and still others prescribe energy-saving solutions. Similarly, the design of a community energy profiling process involves deciding whether to limit the profile to a descriptive account of community energy use or to go further and identify the potential for conservation, substitution and local energy resource development. If the latter choice is made, the next question is whether to include an assessment of the applicability of available measures. Each step along this path takes the profile farther into the energy planning process – and farther away from being merely an information input to that process.

When the four sets of choices are considered – purposes of the community energy profile, its scope/specificity, single vs. staged profile, and how far to go – and when the range of possible combinations is taken into account, it becomes apparent why community energy profiles often vary so much in their content. It also underscores the importance of clarifying in advance what a profile is for and how it fits into the municipality's process of community energy planning and management. This point is elaborated in Chapters 3 and 4.

Alternative Approaches

Two broad categories of methods – direct and indirect – stand out in the community energy profiling experience. Often they are used in combination, to supplement or to act as a check on each other.

Direct methods involve assembling primary and secondary data on energy supply and consumption. Primary data are those collected from original sources; examples include sample surveys of industrial firms, on-site audits, and electric/gas utility and fuel oil suppliers' sales records.

Secondary data have already been collected and probably have been organized as well; the Census, Ontario Hydro's statistical yearbook and assessment records are prominent examples. Direct methods, supplemented by estimates, have been in common use in the United States (far fewer examples exist in Canada).

Indirect methods usually involve calculating energy demands by assuming that they relate to a community's basic physical, social or economic characteristics, such as climate, land use, population, employment and income. "Energy intensity factors", often derived from national or regional averages adjusted to local conditions, express these relationships.

A further distinction can be made, between a top-down and a bottom-up approach to community energy profiling.[5] The former begins with community-wide data or estimates (or with regional, provincial or federal data or estimates) and disaggregates to sectors, fuels and subsequent breakdowns. A bottom-up profile does the opposite, starting with individual subsector/fuel/end use combinations and aggregating upwards to arrive at a total community estimate. A community energy profile is likely to require the use of

both approaches in order to cope with problems of data availability and resources contraints (time, budget, staff).

Examples of the use of direct and indirect methods, incorporating both top-down and bottom-up approaches, are provided in Appendix B.

Generic Methods

A number of generic methods have had a significant influence on the practice of community energy profiling. Five prominent methods are described here: Sizemore (1978), a direct method tailored to small communities; Clarksburg (1978), a direct method named after the West Virginia city to which it was applied; Planner's Energy Workbook, an indirect method developed at the Brookhaven National Laboratory in 1976-77; Hittman (1978), a follow-up of the BNL method, tested in the 16 CCEMP communities; and the County Energy Plan Guidebook (1979), an indirect method developed by the Institute for Ecological Policies and oriented to the soft energy path.[6] The basic references for each of these methods and others are listed in Appendix A.

Sizemore.[7] Sizemore & Associates were commissioned by the U.S. Department of Energy to develop a method for creating energy management plans, suitable for use by small communities (population 10,000 or less). The method was to be capable of application quickly and without extensive equipment, resources, data or expertise. The method (which, as presented, is not easy to follow) begins with the definition of energy problems, the appointment of an energy coordinator and the establishment of a task force, representing "all facets of the community" and backed up by municipal staff, to guide the energy planning process. Next, energy data are collected and analyzed using a direct method. Task force members determine the scope of the energy profile and direct the ensuing surveys; questionnaires are provided for residential, commercial and industrial uses but there are no estimating techniques should the energy data be unavailable. The next step is data analysis followed by identification and evaluation of possible "modifications" and alternative measures. Implementation follows.

The Sizemore method was applied, apparently successfully, to the City of LaGrange, Georgia, "a small community with a population of 26,000 with outstanding leadership in the local government, an extremely capable local utility

director, the commitment of the citizens to actively participate in energy-conservation efforts, and the stability of a long-established textile industry as well as the development of several new industries not associated with textiles."[8]

Clarksburg.[9] InterTechnology/Solar Corporation, funded by the U.S. Department of Energy, developed this approach to an integrated energy management plan for cities and communities. The method consists of five phases: 1. establishing an "energy flow diagram" for the community; 2. identifying local energy resources; 3. identifying and quantifying conservation possibilities and opportunities for integration of energy resources in the community's energy flow diagram; 4. evaluating physical opportunities for integrated energy systems (which generate electrical power at the site where it will be used and recover part of the waste test for other purposes); and 5. assessing institutional, financial, social and technical problems and recommending an implementation plan. The community energy profile part of this method, essentially phase 1, involves four tasks: characterizing the community; determining energy consumption by types of sources and categories of users; determining energy consumption by energy source, by category of user and by end/use within each category; and

establishing the community energy flow diagram. This analysis can be conducted community-wide or for "energy districts", parts of the community having similar characteristics, which may be easier to handle. The profiling method (direct) begins with actual consumption data, drawn from utility companies and major users, for the current year; projections or trends are excluded. "Little guidance is given for alternate procedures to be used if data cannot be obtained."[10] Profiles for energy districts involve "probability distribution" of community-wide data.

The foregoing method was applied to the City of Clarksburg, West Virginia (population about 25,000). "The application resulted in a comprehensive energy management plan that proposed measures to improve the energy supply and demand position of the city, and an institutional framework for the practical implementation of the plan."[11]

Planner's Energy Workbook.[12] This indirect method was developed by T. Owen Carroll, Robert Nathans, Philip Palmedo, R. Stern and others at Brookhaven National Laboratory under the sponsorship of the Federal Energy Administration. The project, initiated in 1974, was designed "to explore the quantitative relationships between alternative regional land use patterns and their resultant

energy and fuel demands and the impacts of these demands on the regional and national energy supply-distribution systems." The Planner's Energy Workbook sets out a straightforward set of procedures that can be used to make energy demands and fuel analyses based on relationships between the community's or region's energy requirements and the spatial arrangement and mix of its land uses. A community energy profile following this method involves: preparing a basic set of energy and land use data for the community; and employing worksheets to apply "energy intensity factors" from the workbook to convert land use activities into energy demands. Energy intensity factors are expressed as BTU/yr. per dwelling unit (residential sector), BTU/yr./sq.ft. (commercial sector), BTU/yr./ employee (industrial sector) and BTU/passenger mile (transportation sector). The method provides for modification of average energy intensity factors to accommodate local climate and certain other factors. The BNL method has been used to assess the impact of land use proposals in at least two cases – a comparison of alternative scenarios for future development in the Long Island-Suffolk region of New York and a proposed urban redevelopment plan in Tucson, Arizona.[13]

Hittman.[14] Hittman Associates, building on earlier work for the U.S. Department of Housing and Urban Development as well as the Brookhaven National Laboratory study, developed a method that local officials can use to develop and evaluate comprehensive community energy management programs. The method assumes that effective local energy planning requires a knowledge of current and future energy use patterns, that energy use is based on a community's physical characteristics and activity patterns as well as climate, and that energy measures must be evaluated not only from an energy standpoint but also in light of other community concerns. The recommended planning process begins with the devising of a work plan and establishment of an organizational structure to guide the process. Energy planning itself involves four steps: 1. conducting a community energy audit to estimate the community's current and projected energy use patterns based on a continuation of present policies; 2. identifying potential energy problems and objectives to alter or reduce the impacts of these problems; 3. identifying means (alternatives and strategies) of achieving the objectives, considering the context and character of the community; and 4. developing the energy management plan and implementation guidelines. The key component of this planning process is the community energy audit. It has two sub-parts:

a. *Accounting of physical components* – identifying and tabulating all energy users in the community for a base year and a selected future year. The underlying assumption is that "energy used in a community is determined to a large extent by the land use composition of that community." Land use is categorized according to residential, commercial/civic/institutional, municipal, industry and transportation uses. Each category is further broken down into parcels that reflect unique energy uses. Data are expressed as number of dwelling units by type, building floor area, number of outdoor lighting fixtures, industrial employment, and vehicle miles traveled per year. Data may be collected from primary and/or secondary sources; alternatively, an estimating procedure based on national or regional averages is provided. Future land uses are determined from population and other projections.

b. *Energy characterization* – using the results of "energy intensity factors" to compute fuel mix and energy use in the community. For example, in the residential sector computations involve identifying the number of units using space heating and cooling, water heating and cooking, then determining the fuel

mix for each of these end uses and calculating the fuel mix for all residential parcel/activities. Energy use is computed by applying energy intensity factors to each parcel/activity/fuel combination. In some cases these factors are determined for the specific community or available primary data are used in their place; in others, average factors supplied in the Hittman workbook can be applied, either modified to local conditions or not, depending on the concern for accuracy.

The Hittman method was designed to be applied to communities of all sizes and scales, with or without technical expertise. "Default values" (rule-of-thumb estimating procedures) are provided to facilitate the application of the method where local data are unavailable or a simplified audit is the aim. The method was extensively tested in the 16 communities participating in the U.S. Department of Energy's Comprehensive Community Energy Management Program during the period 1978-81. The results, and the method itself, are evaluated in Chapter 3.

County Energy Plan Guidebook.[15] This top-down method is aimed at citizen groups and county officials who want to produce a "soft energy plan", oriented to renewable energy

resources, with limited funding, technical resources and time input. The planning process has five steps: determining the county's energy use pattern for a base year; projecting energy consumption to the year 2000 (the hard path continued); identifying the conservation potential, i.e., how much energy could be saved from the year 2000 base through aggressive conservation programs; assessing the potential contribution of renewable resources, especially solar, to meeting the projected energy needs; and finally, using tally sheets provided, assembling the findings into a soft energy plan for the county. Energy profiling in Step 1 involves attempting to collect primary and secondary data locally or, if that proves to be unproductive, using rough estimating procedures provided.[16]

The Guidebook method has found application in a number of countries in the United States.[17] The Calloway County Study, referenced in Appendix B, is one example.

Each of the foregoing methods has its strengths and weaknesses. When a generic method is applied to a specific setting, a careful review should be made of the method's underlying assumptions and their relevance to the community. If this is done, and if the method is properly adapted to community conditions, full value can be derived from the

generic "workbook" approach: as a shortcut into a complex subject and a useful starting point for providing the information needed in an energy planning process.

3. Applications

The methods of community energy profiling described in Chapter 2 have been applied in numerous communities in the United States and in a few places in Canada. This chapter summarizes the U.S. Department of Energy's Comprehensive Community Energy Management Program (CCEMP) under which 16 communities conducted profiles and prepared local energy management plans. CCEMP was selected for emphasis here for four reasons:

1. It is the main source of experience in the community energy profiling field to date;
2. The energy audits/profiles under CCEMP were part of a process of community energy management (profiles done outside CCEMP,a number of them referenced in Appendix B, often have not proceeded further into energy planning and management);

3. Under CCEMP a single profiling method, devised by Hittman Associates, was tested and adapted (elsewhere, various methods were used); and
4. The CCEMP experience has been carefully evaluated and documented.

Chapter 3 begins with a brief description of the CCEMP approach. Then it summarizes the findings of the CCEMP evaluation, giving special attention to its community energy profiling stage and the value of profile results to subsequent phases of community energy planning.

Comprehensive Community Energy Management Program

The Comprehensive Community Energy Management Program of the U.S. Department of Energy (DOE) began in October 1970 with Argonne National Laboratory acting as program manager.[1] The Academy for Contemporary Problems[2] was retained to monitor and evaluate the program which financially assisted 16 communities (initially 17), listed in Table 3.1, to prepare community energy management plans. CCEMP's objectives were to develop, test and demonstrate organizational arrangements and planning/implementation approaches for bringing such plans into effect as well as to expand local energy data bases, to disseminate methods and results, and to develop information relevant to future federal policy. CCEMP was intended as an experiment, a way of learning about energy planning and management at the community level.

TABLE 3.1 CCEMP PILOT COMMUNITIES

Community	Population	Contracted Amount
Small Cities		
1. Boulder, CO	80,000	$242,000
2. Greenville, NC	37,000	$127,000
3. Janesville, WI	50,000	$ 10,000
4. Portland, ME	66,000	$163,000
5. Richmond, IN	44,000	$137,000
Intermediate Cities		
6. Dayton, OH	200,000	$367,000
7. Knoxvill/Knox County, IN	334,000	$200,000
8. Seattle, WA	500,000	$500,000
Large Cities		
9. Los Angeles, CA	2,900,000	$664,000
10. Philadelphia, PA	1,800,000	$450,000
Counties		
11. Allegheny County, PA	1,500,000	$309,000
12. King County, WA	1,164,000	$379,000
13. Wayne County, MI	1,200,000	$110,000
Areawides		
14. Greater Bridgeport, CT	321,000	$272,000
15. South Florida, FL	2,500,000	$200,000
16. Toledo Area COG, OH	536,000	$403,000

Source: Moore et al, 1981. CCEMP contract amounts were provided by Argonne National Laboratory, Energy and Environmental System Division; note that the total program cost in each case was generally higher than the amount shown because the DOE funding rarely covered 100% of the program cost.

The CCEMP demonstration had two main themes:

- Comprehensiveness. In devising their plans communities were to give full consideration to all dimensions of energy use and supply – all sectors, the entire energy system, all reasonable actions, time periods from immediate to long-range, and all available implementation strategies (mandatory and voluntary, regulations and incentives, education and advice, public and private).
- Energy systems, reflecting a perceived need to increase community energy efficiency over the longer run. Six interrelated components comprised this systems approach: the *energy resource* or fuel; *conversion* of the resource to a usable form; *community design* to reduce total energy demands and system inefficiencies by the appropriate location of energy conversion and energy use; *building envelope design* for cost-effective energy use; *selection of appliances and equipment* to minimize expected life-cycle cost; and *operations* to achieve minimum energy cost consistent with demands on the equipment or system.

Of the two themes, comprehensiveness was more influential on the outcomes of CCEMP, mainly because it was more clearly

articulated. DOE recommended a comprehensive planning method to guide the 16 communities. Based largely on the work of Hittman Associates, outlined in Chapter 2, the method foresaw a conventional five-step sequence:

1. Establishing an organizational structure for planning and setting out a project work plan.
2. Estimating ("auditing") the community's energy consumption and supply patterns.
3. Determining community energy management objectives.
4. Identifying and evaluating alternatives and strategies for meeting these objectives.
5. Preparing and adopting a community energy management plan.

Table 3.2 indicates the approximate amount of time consumed by each of the first four stages of the planning process. The 16 communities differed considerably in this respect; explaining much of the variation was the size and complexity of individual communities as well as the planning approach they adopted. Three of the 16 departed significantly from the prescribed planning method from the start. Only a few of the remaining 13 followed the method closely. Most preferred an adaptation that allowed the steps to be pursued concurrently or in repeated cycles rather than in a strict sequence where one step must be completed before the next

one can begin. Also, some of the communities moved into implementation before completing their plans. Altogether, DOE's planning method acted more as a general framework than a specific guide.

TABLE 3.2 TIME REQUIRED FOR STEPS OF CCEMP PLANNING PROCESS

Step	Time Required (months)
1. Getting organized	8 months on average
2. Conducting community energy audit	8-20 months
3. Setting objectives	1-12 months
4. Evaluating alternatives and strategies	5-10 months

Source: Moore et al, 1981

Auditing/Profiling Experience Under CCEMP

Central to the prescribed planning process was the conduct of a community energy audit or profile. Its primary objective was to develop a baseline of community energy consumption and supply data for a selected base year. A brief evaluation of the auditing/profiling experience of the

16 communities follows, with emphasis on three aspects: time and resources expended; application and validity of the Hittman auditing method, including the main problems encountered; and the value of the completed audit to the remaining steps of the local energy planning process.[3]

Resources. All but one of the communities used municipal staff to coordinate the CCEMP project and conduct parts of the technical analysis (the exception subcontracted the entire project to a university research institute). Project managers tended to be individuals with policy or coordinating experience rather than strictly technical backgrounds. Consultants were involved in 12 of the communities.

Most communities took the better part of a year to complete their community energy audits. At the one extreme Seattle accomplished it in only eight months; at the other, South Florida's audit took 20 months while two other communities required 16 months. "Virtually none of the communities finished the energy audit within the time frames set out in their work plans."[4] Most required an extra two to six months and some spent as much as half of their budgets on the audit. The evaluators commented:

> The length of time required to complete energy audits and the technical orientation of the work presented a

> formidable obstacle to the initial operation of community management structures. It committed available staff to the laborious, and often frustrating, task of assembling and calibrating data inputs to the audit. It also compelled newly formed committees to become part of the audit development process at a time when their initial interests and energies might have been more profitably applied to seeking a consensus on community energy issues, objectives and values.[5]

Use of the audit method. Three communities, including the two large cities, did not use the cookbook approach set out by Hittman; one preferred a state-developed econometric model and the other two opted for a method that apportioned utility data among sectors. The remaining 13 communities stayed within Hittman's general methodological framework. Half of them, however, modified the land-use-based method by performing supplementary energy audits or surveys.

Most communities found that the Hittman method produced reasonably valid estimates of energy consumption for the residential, transportation and municipal sectors. But, for the industrial and commercial sectors, the method did not work as well. Industrial and commercial energy consumption can vary widely from community to community; great diversity can also exist within these sectors. More reliable energy consumption estimates for the industrial and commercial sectors in most of the communities had to be derived from a

mix of primary and secondary data techniques and sources rather than through the Hittman method.

Size of community made a difference. The prescribed audit framework proved to be more practical in the medium-sized and smaller communities where the building stock is more homogenous, there are fewer agencies to deal with, and intra/intergovernmental relations are less complex.

Departures from the Hittman method resulted not only from its analytical shortcomings but also from time and budgetary constraints in individual communities. One outcome was that most of them were unable to achieve the level of detail and accuracy originally expected of community energy audits. More fundamental, however, was a mismatch between the data and the purposes the data were intended to serve.

> Spending a large amount of time and money on conducting a highly detailed, built-up audit may result in information that is too detailed for overview and general education purposes. In addition, communities found that the data gathered was not in a form useful for analysis of specific energy management actions.[6]

Community energy audits did prove valuable in portraying sector, fuel and end-use consumption data and as a means of comprehending the local energy situation. But the comprehensive approach taken in CCEMP demonstrated a major problem: "a great deal of time and effort producing

information of limited reliability ... not generally credible to policy committees or elected officials."[7] And it was of less value than expected for the next steps in the planning process.

Use of audit results. The Hittman method assumes that detailed information on energy consumption and supply is an essential prerequisite to determining community energy objectives, evaluating alternative energy management actions, and convincing decision-makers to act. Findings of the CCEMP evaluation challenge this assumption, the Hittman method itself, and the linear comprehensive planning process generally.

The *objectives-formulation* step of the planning process was intended to do two things: produce consensus on community energy issues, and translate this consensus into objectives that the community energy management plan could achieve. Objectives were to be based on a "gap" approach: adding projected energy consumption to the audit results and comparing these estimated future requirements to forecasted energy supplies in order to arrive at quatified future fuel shortages by sector and load use category. Fuel-specific reduction targets for each sector were then expected to

provide the focus for considering alternatives and strategies.

It turned out, however, that there were too many unknowns to allow reliable supply projections to be made beyond a few years hence. Planners also found that potential supply shortages were only one of several critical issues relevant to local energy management (others included energy prices and the relationship between energy and economic development). Eventually, all of the communities abandoned the analytically oriented gap approach to objectives setting in favour of various process-oriented methods that addressed multiple objectives.

The use of community energy audit results in the setting of objectives was further set back by the time over-runs most of the audits incurred and by the desire for committees to get involved. Audits approached as largely technical exercises allowed little participation from members of committees overseeing energy planning processes. Consequently, half of the communities began work on formulating objectives before their audits were completed.

Audit results were also intended to be of assistance in the final step of the planning process, *identifying and*

evaluating alternatives and strategies. Two kinds of choices were anticipated here: what measures (alternatives) would best accomplish the energy objectives just defined; and how each alternative could be implemented (strategies). Information developed in the community energy audit was to be used to estimate the range of potential energy savings associated with each alternative and to assess community imputs of alternative/strategy combinations.

Considerable variation among the 16 communities makes it difficult to generalize on the results of this step. The following findings of the evaluators are worth noting, however:

- Most communities combined alternatives with strategies rather than first screening alternatives and then considering strategies, as the planning method intended. The significance of different alternatives could not be adequately assessed without knowing how they were to be accomplished.
- Four of the communities initiated the alternatives/strategies step at or near completion of their energy audits, bypassing the objectives step altogether. Other communities used objectives either as guidelines in selecting energy actions or as criteria for evaluating them.

- Methods used to assess alternatives varied. All but two of the communities made estimates of energy savings for proposed actions (notably, however, few communities made an effort to analyze alternatives in terms of economic feasibility). More than half of the communities also totaled the estimates of individual savings and compared them to projected or current consumption. But staffs had considerable difficulty in developing acceptable estimates of energy savings and projecting their impact on future consumption, even at a rudimentary level.

One lesson from CCEMP was that analytic methods, including the audit/profile, were less useful than expected, for several reasons.[8] First, they consumed a disproportionate share of available resources yet did not yield the detailed information promised. Second, the comprehensive approach produced large numbers of alternatives, causing limited resources to be spread thinly over many possibilities. Finally, not all CCEMP project staff had the technical backgrounds needed to conduct feasibility and impact analyses. These and other problems, to a considerable extent, were rooted in the planning approach advocated by DOE.

Importance of the Energy Planning Approach

CCEMP was based on a "comprehensive/optimizing" planning approach which relies heavily on the collection and analysis of data as the basis for selecting and evaluating options; the approach is technically oriented and does not require wide participation by effecting and affected interests. By contrast, an "incremental/opportunistic" approach relies more on interaction among government agencies, the private sector and other community interests; analysis is used mainly to determine which actions deserve priority and how they may be implemented,[9] while the former approach emphasizes plan-first-act-later, the latter favours early implementation.[10] The former involves a broad examination to identify the full range of available options; the latter deliberately narrows the search to readily accessible and implementable measures selected on the basis of political and financial feasibility. In the former approach the community energy profile plays a major role; in the latter approach a rough profile is likely to be sufficient, or profiling may be replaced by alternative methods such as targeted surveys of known problems/opportunities and use of process-oriented techniques to identify and evaluate options).[11]

Most of the CCEMP communities began by attempting to apply the comprehensive/optimizing approach recommended by DOE. They had varying degrees of success but "for the most part a systematic approach to energy analysis and planning was not achieved."[12] Three reasons were cited: developing accurate, detailed energy information proved to be quite difficult; political leaders guiding the process were more interested in action to deal with immediate specific problems than with spending a long time gathering and analyzing data; and there was a tendency to build on programs already underway rather than to attempt a sophisticated analysis of community energy systems.

The outcome for CCEMP was that "as yet, few communities have developed comprehensive energy action plans ... (including all sectors, all types of energy sources, and all parts of the energy supply system)."[13] The plans that resulted, summarized in Table 3.3, vary significantly in terms of scope of action (ranging from long lists of general desired actions to well-defined programs and priorities), extent of evaluation (assessment applied to actions, and commitment to implementation (i.e., degree to which implementers and implementing strategies have been defined or are in operation).[14]

TABLE 3.3 CCEMP ACTION PLANS

Category	Characteristics	Communities
1. Selective	Selected actions Limited assessment Limited development of implementing means	Greenville Knoxville Philadelphia South Florida RPC
2. Comprehensive	Broad sets of actions Limited assessment Limited or partial development of implementing means	Boulder Dayton Allegheny County King County Greater Bridgeport RPA Toledo Metro Area COG
3. Program-Oriented	Selected actions Well-developed supporting assessment Identification of implementation steps and responsible agencies	Janesville Portland Seattle Wayne County
4. Early Implementation	Selected actions Emphasis on early implementation during planning process Actions supported with assessment, implementation steps and interagency coordination	Richmond Los Angeles

Source: Moore et al, 1981

Communities that reached the stage of commitment to action exhibited, in their planning, characteristics more closely identified with an incremental approach: early focus on implementation; use of analysis to support and evaluate actions largely selected through political and consensus processes; early and continuing participation by elected officials; emphasis on building from existing activities or supporting clearly perceived community problems; early and continuing participation by elected officials; and the skills and capabilities needed to manage this kind of process. Communities with less developed plans (Categories 1 and 2, the latter largely counties and area-wide planning agencies) showed quite a different set of characteristics. They tended to use the planning agency as the CCEMP project location (rather than placing it in the mayor's office, city manager's office, separate energy office, etc.), rely on multiple committees rather than a single advisory group, delegate major project tasks to consultants, apply general rather than explicit planning guidelines, and use analysis (rather than coordinative and consensus-building processes) to screen and select alternatives.[15]

Despite the apparent predominance of the incremental approach among the communities with more developed action

plans, the CCEMP evaluation makes it clear that "there is no single correct package of process and analysis."[18] Each of the two planning approaches has its pros and cons; each has its unique degree of applicability or inapplicability to specific local contexts. For example, a comprehensive approach may be called for where a community's priority energy problems involve complex tradeoffs (say, between energy benefits and environmental costs), where there is strong public and political support for energy-oriented action (emphasis on means more than on ends), or where the community has the time and other resources necessary for broadly based data collection and analysis. Where other conditions exist – pressure to take action quickly and severely limited resources are examples – a more incremental approach may be better, especially at the outset. Long-term major energy savings, however, are likely to require a more systematic and integrated approach somewhere along the line.

Comprehensive and incremental approaches are not mutually exclusive, however. Each is capable of incorporating some of the advantages of the other. What results is a continuum of possible approaches between the two extremes (neither of which is likely to be applicable anywhere). Such an adaptation shows up in the contrast between the initial

Request for Proposals for CCEMP, which strongly emphasized comprehensive planning in its more extreme form, and the approach suggested in the forthcoming *Community Energy Management Guidebook* that reflects three years of CCEMP experience. The Guidebook spells out six components of a community energy management plan:

1. A statement of issues motivating the community to become involved in energy management.
2. A set of objectives paralleling these issues.
3. A general overview of how energy is used in the community and simple supply/demand projections.
4. A detailed action programs to meet objectives, including a schedule of priorities, a listing of the parties responsible for implementation, and financial and regulatory impediments to be overcome.
5. Where practicable, an analysis of benefits and costs (including side effects) for each action.
6. A program to continue monitoring, evaluation and specification of the program. (Does the plan represent real choices and a specific agenda for action rather than a catalogue of desirable things to be done?)[17]

The comprehensive approach to community energy planning initially recommended by DOE was a strict sequence of steps

that emphasized the importance of energy data and analysis as the basis for determining needs and selecting actions. The compromise approach implied by the foregoing list, while retaining certain comprehensive characteristics, is much more oriented to process, institutional arrangements and management.[18] It emphasizes the identification of community energy issues to which objectives are to be tied. And it downplays the role of the community energy audit/profile; a simpler, more rlexible profile is considered adequate initially, with a data base being built up through ongoing monitoring, planning and management.

What this clearly illustrates is the importance, to the design and conduct of community energy profiles, of the community energy planning management process of which profiling is only one part. It also demonstrates that the *kind* of energy planning approach selected determines what role the profile is to play. A community energy profile is no more than a tool. Its value to a community depends on its users knowing what they want to get out of the profile and then conducting it in a manner appropriate to the community context.

4. Conclusions and Implications

It is difficult to visualize a municipality carrying out effective, credible energy planning without having some form of energy data base. A community energy profile, the experience indicates, can be a useful tool for generating much of the needed information. But the profile can also be a trap, leading to over-expenditure of resources at the front end of the planning process. And, unless carefully conducted, it may not deliver the information that is needed to support energy decisions.

Municipalities undertaking community energy profiles can benefit from experience gained elsewhere, especially in the United States under CCEMP. Lessons learned there can assist a municipality to make the right choices as it designs, prepares and makes use of its community energy profile. This final chapter summarizes the main conclusions drawn from the U.S. profiling experience and indicates their implications for Ontario municipalities.

Conclusions

The evaluation of CCEMP produced a number of conclusions especially relevant to municipalities conducting or comtemplating community energy profiles.[1]

1. A community energy profile can be an important component of community energy planning and management. Its potential especially lies in helping a community gain an understanding of its energy use patterns, i.e., "in providing a snapshot of current energy trends and thus assisting in identifying key issues or problems ... disclosing opportunities where savings can be made or, at least, serving as verification of what was already known or suspected."[2] The latter point is particularly significant where community decision-makers and planners lack experience in dealing with energy issues, where the energy plan is likely to be challenged, or where the municipality is applying for financial assistance. The profile can also have considerable educational value, both for those who conduct it and those who receive it.
2. To a large extent, the role that a community energy profile plays (what it is expected to accomplish) depends on the kind of energy planning approach

taken. In a comprehensive approach emphasizing analysis and a wide scan of all possible options, the profile assumes a larger role than in a more incremental, opportunistic approach that is process-oriented, selective and directed toward early implementation. The pros and cons of each approach and its variants deserve careful consideration, in light of community conditions and municipal capability, when the energy planning approach is determined initially. The community energy profile should then be linked closely into the rest of the planning process, and designed and conducted accordingly.

3. A community energy profile has the potential to serve several purposes that are more specific than merely providing a general picture of the local energy situation. Within the planning process a profile can disclose opportunities for energy management actions, select such actions, and/or support detailed development of the feasibility and impacts of specific programs. A lesson from CCEMP, however, is that while all these purposes have proven useful to community energy planning/management, <u>all</u> of them cannot be accomplished simultaneously at the required level of detail within the usual constraints of time, resources and participant interest.[3] The initial design of a

community energy profile, within the context of the planning approach selected, involves identifying the uses to which the data are expected to be put, considering available resources and community conditions, and deciding which of the foregoing purposes can be accomplished.

A community energy profile is sometimes seen as a means of providing a baseline against which future energy savings may be measured. If this purpose is being considered, it should be recognized that the level of accuracy of data it requires (a data base capable of picking up one or two percent changes in energy consumption each year) and the causal knowledge it calls for (the problem of trying to decide whether observed changes in energy consumption are attributable to energy programs or to other factors) will make extremely heavy demands on resources in the profiling stage. It may be better to look for specific indicators as the means to measure progress.

4. Beginning the local energy planning process with a comprehensive detailed energy profile has some major hazards, the experience indicates. In the CCEMP communities it required large expenditures of time and money. It drew these scarce resources away from, and postponed, the more important later stages of the

planning process where data were to be translated into action. And, in terms of resources expended, it did not yield the expected payoff; only a fraction of the information produced by the community energy audits was later used. In retrospect it appears that a simpler, more general audit/profile would have provided sufficient information for the initial setting of objectives and policies in most communities.

5. A community energy profile must be "tightly focused - and focused early - if it is to avoid the pitfalls of unproductive exercises and yet gather the data genuinely required for energy management."[4] One means of focusing a profile is to conduct it iteratively rather than all at once. Each stage or cycle of the profile can then be adapted to meet the data needs generated by other steps of the energy planning process.[5] An iterative approach responds to the problem of how to limit data collection, not only to avoid spending too much time and effort on it but also to increase the likelihood that the data collected will turn out to be the data actually needed. "Development of information divorced from specific local decision making commitments or intentions has limited impact," the CCEMP evaluators noted.[6] An iterative approach allows the design and conduct of the evolving profile to be more closely

related to and coordinated with other steps in community energy planning. That minimizes the danger of the profile becoming an end in itself, a common tendency when it is prepared separately from consideration of objectives, alternatives and strategies. And it helps ensure that the profile will not consume an inordinate share of the available resources.

6. Round 1 of an iterative community energy profile should be derived from secondary data (utility and supplier records, census, etc.) to the maximum possible extent.[7] Where necessary these data can be supplemented by estimates and/or sample surveys. Profilers should explore a wide range of information sources and be ready to encounter difficulties (such as gaps in the data and mismatches of utility and planning boundaries). Indirect land-use-based methods such as Hittman and the Planner's Energy Workbook, if carefully adapted to the local setting, can be useful for the residential and transportation sectors of communities that have the necessary input land-use data on hand.
7. The forecasting side of community energy profiling in most communities faces too much uncertainty to justify in-depth detailed projections of energy supply and demand. Supply forecasts as part of CCEMP were especially weak. The evaluators observed, "While

forecasting future energy consumption can be done through a variety of approaches, formal quantitative supply projection at the community level is not especially meaningful. In particular, forecasting alternate fuel availability in other than qualitative terms beyond a few years is impossible."[8] They went on to conclude, "It is probably better for communities to make only very general consumption projections and to deal with supply on the basis of known or probably problem areas."[9] A consequence of these problems with energy forecasting was that the projected gap between energy supply and demand in each CCEMP community was not used as the basis for setting objectives, selecting alternatives and devising strategies. On the other hand, demand forecasts, even at a fairly simple level, were found to be potentially useful for illustrating the direction of future energy consumption (helping convince decision-makers and publics of the existence of energy problems and the need to act now). Such forecasts can also aid in estimating conservation/substitution potential and in identifying needed lines of action, taking into account the energy management actions that are likely to occur in the community without intervention by the municipality.[10]

8. In general, community energy planning depended less on profile-generated data and analysis than the intitators of CCEMP believed it would. "It is clear that the communities did not use analytical processes as the exclusive basis for identifying and selecting alternatives/strategies"[11] is an understatement, considering the documented evidence. The community energy profile appeared to play a lesser role than anticipated, mainly because the profiling approach and the energy planning process itself turned out to be less than ideally suited to the circumstances existing in most of the communities.

Implications

The foregoing conclusions, though emanating from a context somewhat different-from this country, have important implications for Ontario municipalities as they move forward into community energy management. Many parts of the United States have experienced supply shortfalls, have paid high energy prices for some time and experience energy problems with more concern and urgency than Canadians do. Yet, as energy prices in Ontario continue to increase, as more people and agencies observe that energy-oriented actions can

help cope with inflation, and as more examples are created to demonstrate what can be done, the process side of the CCEMP experience will be increasingly relevant. The analytic side is already relevant.

In addition to the numerous specific lessons it offers, the CCEMP experience has three broad implications for Ontario municipalities. First, it indicates that community energy profiling should be an iterative process, beginning with a fairly simple profile constructed from available data. Second, it points out that the profile must be clearly and carefully related to the larger process of community energy planning/management. And third, it suggests that the latter process itself deserves to be iterative – evolving a broadly based, integrated program of energy action over time – in light of conditions prevalent in Ontario.

An iterative approach to community energy profiling is no more than common sense, considering the conditions under which the typical profile is conducted and used. It is a way of matching the search for data to the need for data in circumstances where energy problems are ambiguous and available solutions (measures, assistance) are not yet clearly known or institutionalized. The prudent approach then is to go through several cycles of data-problem-

direction-questions-more data-etc. With a subject such as energy, affecting so many aspects of community life, data without direction runs a strong risk of being wasteful and nonproductive. An iterative approach counters this tendency. And it helps planners cope with the chicken-and-egg question, "How much do we need to know in order to know how much we need to know?"

Guidance to profiling, however, needs to come from outside the profiling process if the less attractive part of the CCEMP experience is to be avoided. Once again, common sense indicates that the user of a tool must know what it is to be used for if its potential is to be realized. Since the primary purpose of a community energy profile is to support subsequent planning, political and management decisions, it is apparent that the profile must be well coordinated with other steps in community energy planning, not merely to counter excessive expenditure of resources on data collection but to produce more relevant data. The CCEMP experience warns against the dangers of proceeding with planning in a strict sequence with a major profile as the first step. Decision-makers, trying to decide what the problems are and what to do about them, are unlikely to be convinced by energy data and analysis alone. They respond as well to available measures and to pressure from various

interests; and energy is only one item on their agenda. Meeting their data needs, and attempting to shape the choices before them, requires an approach to data gathering that is closely linked to the data users. It is easier, less costly and less risky to have several rounds of energy profiling than to try and anticipate all the data needs in a single profile.

The same reasons that support an iterative profiling process justify an iterative approach to community energy planning and management. There is an additional reason. A comprehensive detailed sequential approach might make sense where a community exhibits strong public and political support for energy-related action and where the municipality has considerable control over implementation.[12] It is unlikely that any such communities currently exist in Ontario, however. In the average Ontario community, political commitment to energy action at the municipal level is minimal, reflecting an unfocused public concern,[13] while municipal control over implementation at this time appears quite limited (especially on the supply side) for other than in-house measures. In such circumstances it can be expected that data collection, planning and implementing action will proceed gradually, in repeated cycles combining all three kinds of activity, with increasingly ambitious

efforts building on municipal experience and on steadily accumulating public and political support. Such a pattern, documented in Chapter 1, has often shown up elsewhere. A municipality begins with in-house measures, or sometimes with land use planning and control measures; it gains experience, proceeds into a wider set of initiatives, and eventually begins to undertake community outreach actions. Somewhere along the way, the municipality is likely to take a deeper, comprehensive look at its problems and opportunities, the result of which may be a full-fledged community energy management program.

Most Ontario municipalities are in the early in-house stages of this sequence. Many are just entering it and only a few have pursued outreach initiatives. Those taking action so far have proceeded, deliberately or otherwise, in an iterative manner. Four communities, with Ministry of Energy financial assistance, are just beginning the comprehensive planning that marke the cross-over to community energy management.[14]

An iterative community energy planning approach, therefore, fits both the circumstances and the experience of Ontario municipalities. Such an approach could take various forms. Figure 4.1 illustrates one possibility, a synthesis of what

was learned from CCEMP and elsewhere. Shown is the first iteration, beginning with a simple *community energy profile* that overviews the local energy situation and identifies certain problems and opportunities. The profile is an input to the initial setting of *energy objectives*, a process that might involve a cross-section of community interests for the purpose of identifying for further investigation, the most urgent problems and most promising opportunities, expressed as guiding objectives (e.g., to increase energy efficiency in the residential sector).[15] Recognizing that decision-makers prefer to consider means when they determine ends and community concerns when they set priorities, Figure 4.1 provides Step 3 with an information input additional to the profile: a preliminary look at available energy *measures* together with an indication of the perceived energy *issues* in the community.[16] In Step 4, the main *policy, program and strategy options* for meeting the initial set of objectives are identified and evaluated (feasibility studies, cost-benefit and impact analyses, etc.). Adoption of the first-cut *community energy management plan* follows and implementation proceeds (although implementing action could result directly from earlier steps, provided that it was consistent with energy objectives).

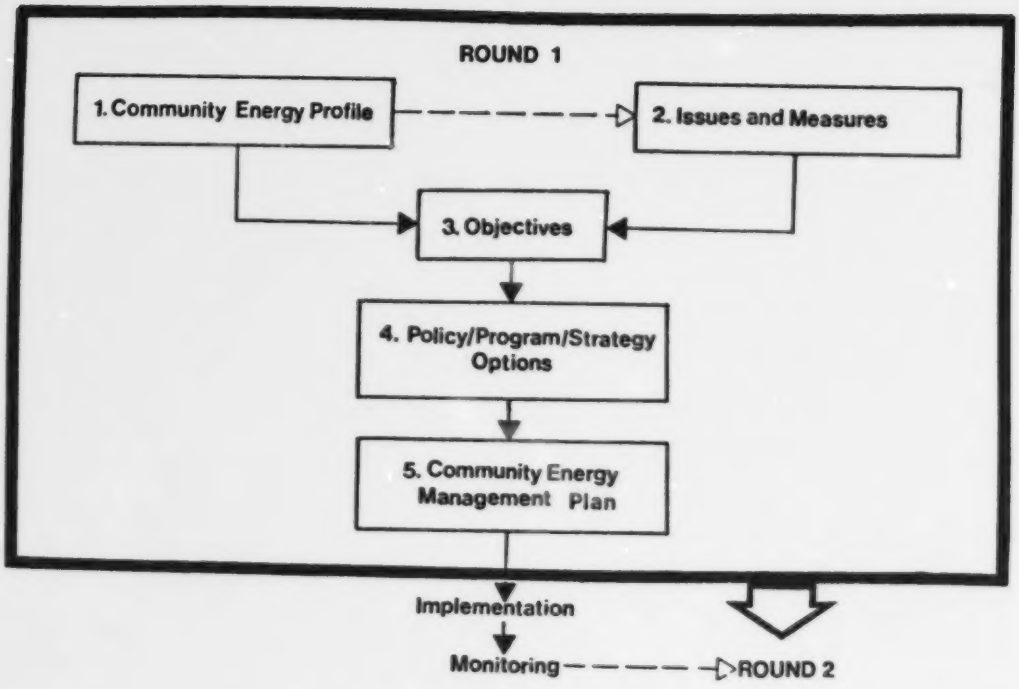

Figure 4.1
An Iterative Community Energy Planning/Management Process

Succeeding cycles of this process could assemble further data (e.g., subsectors and end uses omitted in Round 1), address additional issues, pursue further programs, and respond to changes in the energy situation and the community. Over time, a community following such an approach could expect to evolve an increasingly comprehensive energy plan and integrated community energy management program.

The community energy profile has considerable potential, as a planning tool, to facilitate such a process. Initially,

it can provide background data, familiarize the community with its energy situation, and help define local energy problems and opportunities. In later rounds, a profile can provide more specific information upon which to base the selection and evaluation of policy and program options. Eventually, it may evolve into the energy data baseline needed for monitoring purposes. Throughout, the profile can have broad educative value. And, assuming it is properly conducted, it may strengthen the legitimacy and credibility of the community energy management process.

For now, much of this is still only potential. The community energy profile is a new tool, largely untested in the Ontario municipal setting. Like all tools, it needs a period of development through application. This developmental stage (and that of community energy management generally) would be accelerated by the active exchange of information and experience among involved municipalities, by regular dissemination of that experience to others, and by continuous refinement of the tool as a result of what is learned. The need to make this happen may be the most important implication of all, in light of the energy problems that loom ahead.

Footnotes

CHAPTER 1: CONTEXT

1 Steve Hudson, "Local Government Energy Management Activities: Individual City and County Data". Urban Data Service Reports, Vol. 13, No. 2, Feb. 1981, p. 1. Also: Steve Hudson, "An Assessment of Local Government Energy Management Activities". Urban Data Service Report, Vol. 12, No. 8, Aug. 1980. Both are published by the International City Management Association. The survey, conducted between February and May 1980, presents data for almost 1,500 municipalities across the United States: 1,238 cities of 10,000 population and over; 224 counties of 50,000 population and over; 14 city-county consolidations; and 3 independent cities.

2 Reg Lang and Audrey Armour, Transportation and Energy Conservation in Ontario Municipalities (Downsview: Municipal Transportation Energy Advisory Committee, Nov. 1981). The summary volume of the survey is available from the Committee (c/o Ontario Ministry of Transportation and Communications, 1201 Wilson Ave., Central Building, Downsview, Ont. M3M 1J8). The questionnaire survey was responded to by 77% of the 230 municipalities of population 5,000 and over.

3 American Planning Association, Energy: Local Needs, State Responses and Shrinking Budgets (Chicago: U.S. Dept. of Energy, Chicago Operations Office, Sept. 1981), p. 19. The survey, conducted early in 1981, covered 212 cities and counties of population 5,000 and over in the states of Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.

4 Lang and Armour, ibid. In the in-house transportation sector, the study concluded, measures aimed at vehicle operators and municipal employees tend to be the least used.

5 Davis is documented as a case study in: Reg Lang and Audrey Armour, New Directions in Municipal Energy Conservation: The California Experience (Toronto: Ministry of Energy, 1980), available from Ontario Government Publications Service (880 Bay Street, Fifth Floor, Toronto, Ontario M7A 1N8) for $3.00, cheque payable to Treasurer of Ontario. Davis is also presented as three separate case studies in: Reg Lang and Audrey Armour, Planning Land to Conserve Energy:

40 Case Studies from Canada and the United States (Ottawa: Environment Canada, 1982). For availability, see the list of references.

6 Lang and Armour, Transporatation and Energy Conservation in Ontario Municipalities, ibid. The survey found that only 18% of the responding municipalities had in effect measures to provide energy information to the public. U.S. municipalities are much more active in this regard. The ICMA survey (footnote 1) showed 64.7% of the cities and 61.8% of the country having programs that encourage or require energy conservation in their communities; 33.7% of the cities and 43.8% of the counties had undertaken public education/awareness programs.

7 American Planning Association, ibid., p. 6.

8 Lincoln and San Diego County are described as case studies in: Lang and Armour, Planning Land to Conserve Energy, ibid.

CHAPTER 2: METHODS

1 Reg Lang, "Foreword", in Brampton Energy Profile, prepared by Local Energy Action Study Team (Downsview: York University, Faculty of Environmental Studies, April 1981).

2 Richard L. Secor, "The Critical Value of Energy Audits", in Energy Auditing and Conservation: Methods, Measurements, Management and Case Studies, ed. Yacov Y. Haimes (Washington: Hemisphere Publishing Corporation, 1980), p. 1.

3 W.P. Pferdehirt, with N.F. Kron, Jr. and J.F. Tschanz, An Introduction to Community Energy Auditing: Analyzing Supplies, Demands and Systems in a Community (Argonne, IL: Argonne National Laboratory, 1981), p. 1.

4 ibid. and other sources.

5 ibid., p. 27.

6 Each of these methods is given a brief critical examination (Hittman is examined in depth) in Pferdehirt et al, ibid. Another methodological review is: City of Chicago, A Methodology for Energy Impact Analysis of Urban Development Projects. Volume 5: Techniques for Determining Community Energy Patterns (Chicago: The City, Dept. of Planning, May 1980). It considered in detail three "candidate methodologies" - Clarksburg, Hittman and Brookhaven National Laboratory - and settled on an adaptation of the BNL method for use by the City. Volume 6: Annotated Bibliography provides additional information.

7 Sizemore & Associates, Methodology for Energy Management Plans for Small Communities (Washington, DC: U.S. Dept. of Energy, July 1978).

8 City of Chicago, ibid., Volume 6, p. 49.

9 InterTechnology/Solar Corporation, Development of a Comprehensive Community Energy Management Plan for the City of Clarksburg, West Virginia. Final Report (Warrenton, VA: The Corporation, 1977).

10 Pferdehirt, ibid., p. 69.

11 City of Chicago, ibid., Volume 5, p. 21.

12 T. Owen Carroll, et al. The Planner's Energy Workbook: A User's Manual for Exploring Land Use and Energy Utilization Relationships (Upton, NY: Brookhaven National Laboratory, Oct. 1976). Other relevant reports, also by Carroll et al, are: Land Use and Energy Utilization, Interim Report, Oct. 1975; Land Use - Energy Simulation Model: A Computer-Based Model for Exploring Land Use and Energy Relationships, Sept. 1976; and Land Use and Energy Utilization, Final Report, June 1977. The method is summarized in: T. Owen Carroll, "Calculating Community Energy Demands", in Energy Use and the Community, ed. Raymond J. Burby and A. Fleming Bell (Cambridge, MA: Ballinger, 1978).

13 City of Chicago, ibid., Vol. 5, p. 31.

14 Hittman Associates, Inc., Comprehensive Community Energy Management. Volume 1: A Workbook. Volume 2: Appendices. Volume 3: Worksheets (Washington, DC: U.S. Dept. of Energy, 1978).

15 Alan Okagaki and Jim Benson, County Energy Plan Guidebook: Creating a Renewable Energy Future (Fairfax, VA: Institute for Ecological Policies, 1979).

16 Pferdehirt, ibid., p. 35, criticizes the Guidebook method for leaving most of its assumptions and their implications unstated, and for an oversimplified approach to estimating renewable resource potential, while acknowledging that the Guidebook "can serve as a useful introduction to energy estimating procedures".

17 Jim Benson, founder and director of the Institute for Ecological Studies, stated in an interview in County Energy Forum, Nov. 30, 1981: "Since the Guidebook came out in the late summer of 1979, we have distributed about 13,000 copies ... Over the last two-and-a-half years or so, I have heard of aproximately 300 studies that have used one of our books to some degree. And out of those, I would guess that 80 to 100 have been completed and turned into worthwhile recommendations or in many cases even concrete actions through the decision-making process".

CHAPTER 3: APPLICATIONS

1 The program manager is Michael Meshenberg (Argonne National Laboratory, Energy and Environmental Systems Division, 9700 South Cass Avenue, Building 11, Argonne, IL 60439).

2 The contact at the Academy for Contemporary Problems (1501 Neil Avenue, Columbus, Ohio) is David Berger. The Academy's evaluation of CCEMP is documented in: J.L. Moore, D.A. Berger, H.M. Griggs and C.B. Rubin, The Comprehensive Community Energy Management Program: An Evaluation (Argonne, IL: Argonne National Laboratory, Dec. 1981). Unless footnotes indicate otherwise, this document is the source for information about CCEMP cited in this chapter.

3 A summary evaluation of the community energy auditing experience of the 16 CCEMP communities is provided in Moore et al, ibid. A more detailed, earlier examination can be found in Moore et al, Community Energy Auditing: Experience with the Comprehensive Community Energy Management Program (Argonne, IL: Argonne National Laboratory, Sept. 1980). A further and valuable source, more prescriptive than evaluative, is W.P. Pferdehirt, with N.F. Kron, J.A. and J.F. Tschanz, An Introduction to Community Energy Auditing: Analyzing Supplies, Demands and Systems in a Community (Argonne, IL: Argonne National Laboratory, Sept. 1981).

4 Moore et al, 1981, p. 190.

5 ibid.

6 ibid., p. 236.

7 ibid., p 232.

8 ibid., p. 247.

9 The various features of the two approaches are compared in Moore et al, pp. 33-36 and 47-48. A similar distinction can be found in: Duncan Erley and David Mosena, Energy Conserving Development Regulations: Current Practice (Chicago: American Planning Association, Planning Advisory Service Report 352, Aug. 1980); available from APA (1313 East 60th Street, Chicago, IL 60637), $12.00, or $6.00 to PAS subscribers.

10 Moore et al, 1981, ibid., emphasize, "It is not necessary to delay implementation of particular programs until the plan is prepared and adopted" (p. 171) and "Despite the 'comprehensive' and 'systematic' nature of the CCEMP process, there was a natural and strong tendency for action-oriented lead agencies to follow lines of opportunity as they developed and to engage in early action" (p. 206).

11 An example of an alternative method is the checklist of "Twenty Questions Identifying Energy Management Actions for Your Community" provided in: Puget Sound Council of Governments and Bonneville Power Administration, Energy Management Workbook for Local Governments. Workbook 1: Electrical Energy (Seattle: The Council, 1981). Available, apparently free, from either the Council (216 First Avenue South, Seattle, WA 98109) or the Administration (P.O. Box 3621, Portland, OR 97208).

12 Moore et al, 1981, ibid., p. 36.

13 ibid., p. 262.

14 ibid., p. 256.

15 ibid., p. 260-261 and 268.

16 ibid., p. 47.

17 ibid., pp. 88-89. Table 7 on page 89 compares the Request for Proposals' criteria with the Community Energy Management Guidebook's criteria. The Guidebook, prepared by staff of the Argonne National Laboratory, Energy and Environmental Systems Division, under the direction of Michael Meshenberg, is due for publication by ANL in the first half of 1982.

18 At the Workshop on Community Energy Profiling held at York University on 23 October 1981, David Berger argued that the two most important variables in a community energy planning process are: 1. the degree of competence of the program manager (political and interactive skills being more important than technical capability); and 2. the level of existing interest in the community.

CHAPTER 4: CONCLUSIONS AND IMPLICATIONS

1 The two reports, by Moore et al (1981) and by Pferdehirt, offer a wealth of information and lessons directly relevant to communities considering community energy profiling, planning and management. The findings presented here necessarily are only a subset of the findings documented in those two reports. Moore et al, especially, extends to all aspects (e.g., organizational) of community energy management.

2 Moore et al, 1981, ibid., p. 234.

3 ibid., p. 172.

4 Pferdehirt, ibid., p. 6.

5 The iterative approach is recommended by Pferdehirt, ibid. and by Moore et al, ibid., p. 171. In the literature of methodology, an iterative approach is a form of "looping procedure" that allows the analyst interplay between information and objectives; both are enriched as a consequence of each iteration.

6 Moore et al, ibid., p. 232.

7 Pferdehirt, ibid., p. 40; Moore et al, ibid., p. 236.

8 Moore et al, ibid., p. 243.

9 ibid.

10 California Energy Commission, Local Energy Planning Handbook (Sacramento: CEC, Conservation Division, Nov. 1981), p. 3-13. The Handbook provides a "base case" projection that estimates 1990 electricity and natural gas demand for the state, then provides a procedure for translating these projections to each of 15 sub-state zones. The base case projection takes into account expected changes in the relative prices of these two fuels, consumer reponses and certain government programs. A further procedure is provided to enable a municipality in a given zone to estimate its remaining conservation potential (i.e., the potential remaining after price increases and state and utility programs have had their effect).

11 Moore et al, 1981, ibid., p. 247. Two types of information that proved consistently useful in communicating with decision-makers and the general public were 1. translating future energy costs and specific savings into personal terms (e.g., effect on the average household budget), and 2. developing projected energy consumption baselines against which savings by individuals or from programs could be compared.

12 Outstanding U.S. examples of such communities are Seattle, Washington (where, for example, the City controls the electric utility), and Portland, Oregon. Even in the latter case, however, the City official in charge of the comprehensive energy planning process declared, in retrospect, that the extensive detailed energy data base (see Appendix A) was unnecessary. Source: comments by Marion Hemphill to National Symposium on Energy Conservation through Land Use Planning, Montreal.

13 The recent survey of Ontario municipalities, cited in Chapter 1, found that only 15% of municipal officials felt there would be significant energy problems in their municipalities during the next 5 to 10 years; 32% did not foresee such problems and the rest, half of the respondents, weren't sure. See Reg Lang and Audrey Armour, Transportation and Energy Conservation in Ontario Municipalities. Volume 1: Summary (Toronto: Ministry of Transportation and Communications, Nov. 1981).

14 On 16 February 1982 The Ministry announced that four Ontario cities – Brampton, Burlington, Ottawa and Stratford – had been selected to participate in the Community Energy Management Demonstration. Each of the communities had earlier involvement with some aspect of energy conservation. Over the next 1 - 3 years the four municipalities will develop community energy management plans that include an assessment (profile) of the local energy situation, review of opportunities for energy savings throughout the community, specific energy conservation targets, policies and strategies to achieve these targets, and a means of monitoring accomplishments.

15 Moore et al, ibid., p. 203-205, document the wide range of techniques employed by CCEMP communities as they established energy objectives: delphi process, brainstorming, ranking, review of consultant drafts, workshops, town meetings, neighbourhood and community organization meetings, and an energy futures conference.

16 In the USA various information resources have been created to assist this step. For example, the Massachusetts Office of Energy Resources, as part of a series, "Massachusetts Local Energy Action Program", has prepared a Local Actions Catalog and a set of Case Histories (the five-volume set of which these two reports are part is available from the Massachusetts Office of Energy Resources, 72 Tremont St., Boston, MA 02108). Argonne National Laboratory commissioned the MITRE Corporation to prepare Energy Management Options for Communities, a catalogue of available measures and strategies each described briefly including information on potential energy savings, implementation costs, payback period and cautions (contact Michael Meshenberg at A.N.L. or Yale Schiffman, The MITRE Corporation, 1820 Dolley Madison Boulevard, McLean, VA 22101). The U.S. National Science Foundation had prepared, by BDM Corporation, the report, Study of Alternative Strategies and Methods for Conserving Energy, 1977, which used a technology assessment approach to analyze 103 energy conservation measures; subsequently classified into nine generic categories (order no. PB-283-758, available from National Technical Information Service).

Appendix A: Annotated Bibliography on Community Energy Profiling

California Energy Commission. Local Energy Planning Handbook. Sacramento: CEC, Nov. 1981. 146 pp. + app. and worksheets. Available from California Energy Commission, Conservation Division; Local Government Assistance Program (1111 Howe Avenue, Sacramento, CA 95825), unpriced.

Designed to assist local governments in California to prepare energy plans, this handbook provides detailed and general methods for determining local patterns of energy supply and conservation as well as for determining consumption potential, assessing policy options and examining the economics of energy flows.

Carroll, T. Owen, et al. The Planner's Energy Workbook: A User's Manual for Exploring Land Use and Energy Utilization Relationships. Upton, NY: Brookhaven National Laboratory, Oct. 1976. 96 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. BNL 50633, $9.50.

Designed as "a set of procedures that could be used by local planners to carry out their own community and regional energy analyses", this method makes use of a series of "energy intensity coefficients" to estimate a community's energy consumption for residential, commercial, industrial and transportation uses. See also: Land Use and Energy Utilization, Final Report, June 1977 (BNL 50635, $6.50 from NTIS).

CCEMP Newsletter, subsequently Community Energy Program Newsletter. Prepared by and available from CCEMP Program, Argonne National Laboratory, Energy and Environmental Systems Division (9700 South Cass Avenue, Building 11, Argonne, IL 60439).

This newsletter, released irregularly from 1979 to 1981, described progress under the Comprehensive Community Energy Management Program, provided an information exchange for its participants and offered other relevant information.

Chicago, City of, Dept. of Planning, and University of Illinois, Energy Resources Center. A Methodology for Energy Impact Analysis of Urban Development Projects. Volume 5: Techniques for Determining Community Energy Patterns. Chicago: The Dept., May 1980. 86 pp. Available from City of Chicago, Deptartment of Planning (City Hall, Room 1000, 121 North LaSalle Street, Chicago, IL 60602), unpriced.

This report compares several community energy management methods — Hittman, Brookhaven National Laboratory, and Clarksburg, West Virginia — and synthesizes a procedure, largely based on the BNL approach, for estimating energy impacts at the local level. "Energy impact" is defined as a change in the level or pattern of community energy consumption that results from actual or projected changes in physical land use patterns. Given a proposed development project, the procedure allows the use of primary or secondary data for small areas to estimate changes in energy use in the community in which the project is located or which may be affected by it. Other volumes in the report series are: 1. Project Overview; 2. Options and Opportunities for Local Government; 3. Energy Impact Analysis Process Design; 4. Techniques for Predicting Energy Consumption in Proposed Buildings; and 6. Annotated Bibliography.

Energy, Mines and Resources Canada, Conservation and Renewable Energy Branch. Municipal Energy Audit: A Practical Guide to the Identification of Energy Expenditures. Preliminary Draft. Ottawa: EMR, Jan. 1980. 75 pp. + ap. Available from The Branch (Ottawa, Ontario K1A 0E4), no charge.

A municipal energy audit focuses on the in-house operations of the municipal corporation (as such, it is not a community energy profile but may provide useful data for a CEP). This publication describes a method tested in seven Canadian cities ranging in population from 1,800 to 560,000: Montague and Summerside, P.E.I.; Saint John, N.B.; Granby, Que.; Ottawa, Ont.; Winnipeg, Man.; and Victoria, B.C.

Hittman Associates, Inc. Comprehensive Community Energy Management. Volume 1: A Workbook. 146 pp. Volume 2: Appendices. 225 pp. Volume 3: Worksheets. 106 pp. Washington, DC: U.S. Dept. of Energy, 1978. Volume 1 available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. HCP/M0023-01, $12.50. Volume 2 also available from NTIS, Order No. HCP/M0023-02, $17.00. Availability of Volume 3 is uncertain; try U.S. Dept. of Energy, Office of Buildings and Community Systems (Washington, DC 20585).

Sets out a five-stage process: devising a work plan, conducting a community energy audit, formulating energy objectives, identifying and assessing alternatives and strategies, and implementation. The energy audit method involves an accounting of the community's physical components and a characterization of its energy use, based on the assumption that energy consumption is largely determined by end-use. The Hittman method was tested in the 16 CCEMP communities; results are evaluated in Pferdehirt (1981) and Moore et al (1980 and 1981).

InterTechnology/Solar Corporation. Development of a Comprehensive Community Energy Management Plan for the City of Clarksburg, West Virginia. Final Report. Warrenton, VA: The Corporation, Feb. 1977. 300 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. ORO-5010-3, $21.50.

The community energy planning method developed in this report has five phases: preparation of an "energy flow diagram" by energy form, users and end uses; investigation of local energy resources; identification and quantification of opportunities for conservation and for use of local energy resources; evaluation of technical feasibility and various impacts of integrated energy uses; and analysis of impacts of alternative energy systems together with recommendations for implementation. The method was applied to the City of Clarksburg which has since implemented parts of its energy management plan.

Johnson, Sue and Metzger, James E. Arkansas Community Energy Study Handbook. Little Rock: Arkansas Dept. of Energy, Jan. 1981. Available from the Dept. (3000 Kavanaugh, Little Rock, Arkansas 72205), unpriced.

Part 2 of the Handbook is titled "The Way Things Are: Determining Levels of Present and Recent Past Energy Use by Sector". It describes a method for conducting a community energy profile using secondary data and estimating techniques. Part 3, "Looking Ahead", deals with projections of energy use.

Lang, Reg and Armour, Audrey. Guide to Community Energy Profiling. Draft. Toronto: Ontario Ministry of Energy, March 1982. Available from the Ministry (56 Wellesley Street West, Toronto, Ontario M7A 2B7), no charge.

The draft guide presents a five-step method for conducting a rough-cut community energy profile in the first round of a community energy planning/management process.

Lang, Reg and Armour, Audrey. Planning Land to Conserve Energy: 40 Case Studies from Canada and the United States. Ottawa: Environment Canada, 1982. Available from Environment Canada, Lands Directorate (Ottawa, Ontario K1A 0E7), no charge.

Chapter 2 deals with community energy profiles. Six case studies are described: Seattle and King County, Washington; Greenville, North Carolina; Santa Clara County, California; Renfrew County, Ontario; Notre Dame de Grâce in Montreal, Quebec; and Hillsborough County, Florida. Other chapters and the remaining 34 case studies deal with land use and energy conservation in general, municipal plans and policies, new communities and residential development, non-residential land use, land use and development controls, and strategies.

Moore, John L., et al. Community Energy Auditing: Experience with the Comprehensive Community Energy Management Program. Argonne, IL: Argonne National Laboratory, Sept. 1980. 101 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. CNSZ-TM-43, $11.00.

A preliminary critical analysis of the energy auditing/profiling experiences of the 16 CCEMP communities. Includes an examination of their planning processes to date, with emphasis on developing organizational structures and setting objectives). See also Moore et al, 1981, below.

Moore, John L., et al. Organizing for Comprehensive Community Energy Management Planning: Some Preliminary Observations. Argonne, IL: Argonne National Laboratory, Dec. 1979. 58 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. ANL/CNSZ-TM-27, $8.00.

The first report by the CCEMP evaluators. Examines and presents findings on the ways that CCEMP communities organized to undertake local energy planning. See also Moore et al, 1981, below.

Moore, J.L., et al. The Comprehensive Community Energy Management Program: An Evaluation. Argonne, IL: Argonne National Laboratory, Dec. 1981. 430 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. ANL/CNSV-TM-89, $30.50.

The Academy for Contemporary Problems (now the Academy for State and Local Governments, 1501 Neil Avenue, Columbus, OH) was charged with monitoring and evaluating the CCEMP in 16 communities across the USA. This final report by ACP staff provides background on CCEMP, offers lessons for local energy management planning, describes each of the community settings, outlines the planning process (including organizational arrangements and the community energy audit stage) and their outcomes, and provides summary conclusions. A detailed apendix reviews each of the 16 cases separately.

National Research Council, Committee on Measurement of Energy Consumption. Energy Consumption Measurement: Data Needs for Public Policy. Washington, DC: National Academy of Sciences, 1977, 113 pp. Available from Printing and Publishing Office, National Academy of Sciences (2101 Constitution Avenue NW, Washington, DC 20418), $6.50.

Identifies major needs for improved data on energy consumption, specifies the types of data that should be collected, and suggests general methods of collecting and organizing these data for use in designing and evaluating public policy. Three broad purposes to be served by energy consumption data are defined: monitoring and describing, modeling, and assessing public policies; each purpose requires different data.

Okagaki, Alan and Benson, Jim. County Energy Plan Guidebook: Creating a Renewable Energy Future. Fairfax, VA: Institute for Ecological Policies, 1979. 200 pp. Available from the Institute (9208 Christopher Street, Fairfax, VA 22031), $7.50 plus postage.

Aimed at citizens and county-level officials and oriented toward the soft path, renewable resources and conservation. Part 1 presents theory, methods and techniques for producing a first cut of a quantified soft-energy county-wide energy plan. Part 2 gives suggestions on mobilizing political support for the plan, initiating conservation and alternative energy projects, and dealing with local governments and the news media. A supplementary volume is: Elizabeth Schaefer and Jim Benson, Energy and Power in Your Community: How to Analyze Where it Comes From, How Much it Costs and Who Controls It, 1980, 134 pp., available from the Institude for $6.00. This book is for activists who want to explore all aspects of the energy delivery system and who are interested in bringing energy supply under greater local control.

Odum, Howard T. "Energy Analysis, Energy Quality and Environment", pp. 55-87. In Energy Analysis: A New Public Policy Tool, ed. by Martha W. Gilliland. Boulder, CO: Westview Press, 1978.

"Energy analysis is the modeling of systems accompanied by an evaluation of the energy flows inherent in the system. It includes a synthesis of parts into whole patterns where energy flow is used as the common unit of measure among parts." Energy analysis, or the basic science of energetics, provides an alternative planning tool. Its application at the local level so far appears to be quite limited (the Hillsborough County report, cited in the next section, is one example). For a general source on the method see: Howard T. Odum and Elizabeth C. Odum, Energy Basis for Man and Nature (New York: McGraw-Hill, 1976).

Pferdehirt, W.P., with Kron, N.F. Jr. and Tschanz, J.F. An Introduction to Community Energy Auditing: Analyzing Supplies, Demands and Systems in a Community. Argonne, IL: Argonne National Laboratory, Sept. 1981. 87 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. ANL/CNSV-24, $9.50.

This report, drawing on the CCEMP experience, presents basic concepts of community energy auditing and one method for conducting an audit. It also analyzes the components of a comprehensive community energy audit, assembles available literature on the subject and compares three existing methods (Planner's Energy Workbook, Hittman and County Energy Plan Guidebook).

Portland, City of, Bureau of Planning. Energy Conservation Choices for the City of Portland, Oregon. Volume 1: Preliminary Energy Data and Analysis. Portland, OR: The City, 1977. 343 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield VA 22161), Order No. PB 276779, $24.50.

Sponsored by the U.S. Department of Housing and Urban Development, this report (part of a 10-volume set) discusses data collection problems and then determines energy use patterns for the residential, commercial/ industrial, municipal government and transportation sectors.

Puget Sound Council of Governments and Bonneville Power Administration. Energy Management Workbook for Local Governments. Workbook 1: Electrical Energy. Seattle; The Council, 1981. 90 pp. Available from Puget Sound Council of Governments (216 First Avenue South, Seattle, WA 98109) or Bonneville Power Administration (P.O. Box 3621, Portland, OR 97208), no charge.

Designed to help municipalities develop comprehensive energy strategies, this workbook (accompanied by an appendix volume) describes 20 categories of energy actions and sets out a "questioning process" to assist in evaluating the applicability of these measures to a given locality. This approach is an alternative to use of a community energy profile, although the two approaches can be applied together in a complementary fashion.

Sizemore and Associates. Methodology for Energy Management Plans for Small Communities. Washington, DC: U.S. Dept. of Energy, July 1978. 165 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), Order No. HCP/M1834-01, $14.00.

Sets out a method for preparing a community energy management plan for municipalities of 10,000 population or less. Applied in the City of LaGrange, Georgia, with Sizemore and Associates as consultants. See: La Grange Energy Resource Management Program, Nov. 1977.

Appendix B: Examples of Community Energy Profiles

This appendix lists a number of published community energy audits/profiles. They are divided into two groups: those done under the U.S. Department of Energy's Comprehensive Community Energy Management Program (CCEMP), and others in Canada and the United States. Profile documents are listed by municipality. The annotation provides relevant information about the community, the profiling method and, where available, how the profile was used in the planning process. Addresses of key agencies are shown along with information on obtaining the document.

CCEMP Examples*

ALLEGHENY COUNTY
Pennsylvania

Carnegie-Mellon Institute of Research. Allegheny County Community Energy Audit. Pittsburgh: Allegheny County Dept. of Planning and Development (1300 Allegheny Bldg., 429 Forbes Avenue, Pittsburgh, PA 15219), Oct. 1980.

CCEMP area (pop. 1,500,000) included City of Pittsburgh. County is heavily industrialized; has experienced significant population decline. Employed Hittman method (profile took 14 months) with secondary data. Profile used as background for sector subcommittee discussions.

* The energy planning experience of each of the 16 communities is documented in detail in the Appendix of J.L. Moore, et al, The Comprehensive Community Energy Management Program: An Evaluation (Argonne, IL: Argonne National Laboratory, Dec. 1981). The CCEMP documents and other audit/profile examples are listed in: Wayne P. Pferdehirt et al, An Introduction to Community Energy Auditing: Analyzing Supplies, Demands and Systems in a Community (Argonne National Laboratory, 1981).

BOULDER
Colorado

City of Boulder. Community Energy Management Plan. Volume I: Energy Use Study. Volume II: Energy Use Study, Commercial/Industrial. Boulder: The City (City Energy Office, City Planning Department, P.O. Box 791, Boulder, CO 80306), May 1980.

A small growing city (pop. 80,000) at the edge of the Denver metropolitan area. Employed Hittman method (took 12 months) supplemented by commercial/industrial audits and residential survey. Profile used as background for task force members.

DAYTON
Ohio

City of Dayton. City of Dayton Comprehensive Plan – Appendix. Final Draft Manuscript. Dayton: The City, Department of Control Services (Municipal Building, 3rd and Ludlow Streets, Dayton, OH 45041), Feb. 1981.

An older industrial city (pop. 200,000) experiencing decline in its industrial base and population. Employed Hittman method (took 16 months) supplemented by commercial survey and industrial audits. Profile used to select sector/fuel objectives and as baseline for estimating potential contribution of candidate actions.

GREATER
BRIDGEPORT
Connecticut

Flaherty-Giavara Associates. Regional Energy Project – Audit Report. Bridgeport: Greater Bridgeport Regional Planning Agency (525 Water Street, Bridgeport, CT 06604), Jan. 1980. Greater Bridgeport Regional Planning Agency. The Economics of Energy. Jan. 1980. Energy Audit, Executive Summary. Feb. 1980.

GBRPA covers Bridgeport and five suburban cities in a relatively compact urban area (pop. 321,000). Profile method apportioned aggregate time series utility and other secondary data among sectors; took 13 months to complete. Profile used to inform the public and as back-up rationale for issues and objectives.

GREENVILLE
North
Carolina

Butler and Associates. Energy Audit for Greenville, N.C., 1978. Greenville: Greenville Utility Commission, Office of Energy Conservation and Management (Greenville, NC 27834), March 1980.

Rapidly growing city (pop. 37,000) in the south Atlantic coastal region; electric distribution system is city-owned. Employed Hittman method (took 10 months) supplemented by industrial survey and utility data. Profile used for educational purposes.

JANESVILLE
Wisconsin

Knoerr, David. Comprehensive Community Energy Management Program: Energy Audit. Janesville: City of Janesville Planning Dept. (City Hall, 18 N. Jackson Street, Janesville, WI 53545), March 1980.

A slowly growing midwestern industrial city (pop. 50,000). Profile, by city staff over 14 months, was based on aggregate time series data apportioned to residential and municipal sectors (other sectors not covered). Trends disclosed from the profile assisted in setting of conservation objectives.

KING COUNTY
Washington

Dicker, Martin. King County Energy Use: Methodology and Results. Seattle: King County Executive Office (400 King County Court House, Seattle, WA 98104), May 1980.

Adjoins Seattle (combined pop. 1,164,000); city and county cooperated on their CCEMP projects. Employed Hittman method (over 12 months) supplemented by residential sector survey and industrial audits. Profile used in selection of issues and goals as well as baseline for determining potential contribution of candidate actions.

KNOXVILLE and KNOX COUNTY Tennessee

Knoxville/Knox County Metropolitan Planning Commission. Community Energy Use Profile. Knoxville: The Commission (City Hall Park, Building A, Knoxville, TN 37902), Sept. 1980.

Slow-growing metropolitan area (pop. 334,000); city-owned electrical distribution system purchases power from TVA headquartered in Knoxville. Employed Hittman method (took 11 months) based on secondary data. Profile used as baseline for estimating potential contribution of candidate actions and for public relations purposes, to dramatize energy issues.

LOS ANGELES California

Energy/LA Staff. Community-Wide Energy Audit. Los Angeles: The City, Office of the Mayor (City Hall, Los Angeles, CA 90012), Aug. 1980.

Classic example of the spread-out city (pop. 2,900,000) heavily dependent on the automobile for transportation. Profile method, over 14 months, based on data from energy suppliers supplemented by state model, Hittman method and staff estimates. Profile used as baseline against which to compare program savings; also, background data for sector estimates and in public relations.

PHILADELPHIA Pennsylvania

Daspit, C. Citywide Audit. Philadelphia: The City, Office of the Energy Coordinator (160 Municipal Service Building, Philadelphia, PA 19107), Aug. 1979. Cohen, S. and Daspit, C. Industrial Audit. Oct. 1979. Bolno, J. Commercial Audit. Oct. 1979. Bolno, J. Municipal Audit. Oct. 1979. Butz, B. Philadelphia Energy Projections. Oct. 1979.

Older, large, central city (pop. 1,800,000), heavily industrialized and declining in population; city-owned natural gas distribution system and part of downtown served by district heating. Profile method, over 10 months, obtained city-wide audit and projections from utility data/estimates and sector estimates by apportioning aggregate utility data supplemented by municipal audits, commercial

sample (largely unsuccessful), simulation and utility data for industrial, and state data and Hittman method for transportation. Profile used as background for sector task force reports and subcommittee discussions; also time series baseline for calculating community trends, energy costs and projections.

PORTLAND
Maine

Portland Energy Office. 1978 Preliminary Energy Audit. Portland: The City (389 Congress Street, Portland, ME 04101), April 1980.

Representative northeastern city (pop. 66,000) with stable population and aging, energy-inefficient building stock. Employed Hittman method supplemented by disaggregated utility data for residential sector and 100% survey of industrial sector. Profile used as background for task forces in determining objectives and alternatives and as baseline for calculating potential energy savings.

SEATTLE
Washington

ENERGY, Ltd. Energy Data Base: Work in Progress Report No. 1. Seattle: City of Seattle, Executive Department – Energy Office (920 Arctic Building, Seattle, WA 98104), Jan. 1980.

Regional centre (pop. 500,000) of Pacific Northwest; city-owned electric utility. Among the most energy-experienced of the CCEMP communities. Profile, done in 8 months, used Hittman method supplemented by survey of commercial sector and industrial audits. Profile used: in selection of goals, policies and management tasks; as baseline for estimating potential contribution of candidate actions; and as baseline for assessing impacts of recommended program.

SOUTH FLORIDA REGION
Florida

Alereza, T. and McCarthy, P.M., ADM Associates. Community Energy Analysis for the South Florida Region. Miami: South Florida Regional Planning Council (1515 N.W. 167th Street, Suite 429, Miami, FL 33169), Nov. 1979.
South Florida Regional Planning Council. South Florida Regional Energy Audit. March 1981.

Region (pop. 2,500,000) includes Dade, Broward and Monroe Counties; fast-growing coastal development, agriculture and large uninhabited areas in sub-tropical climate. Profile, over 20 months, employed Hittman method plus area-specific basic energy factors and commercial/industrial planning, for Developments of Regional Impact assessments, and as data base for individual communities.

TOLEDO METRO AREA Ohio

Toledo Metropolitan Area Council of Governments Agricultural Sector: Baseline Energy Use – 1978. Toledo: The Council (123 Michigan Street, Toledo, OH 43624), April 1980. Residential Sector: Baseline Energy Use – 1978. Nov. 1980. Municipal Sector: Baseline Energy Use – 1978. Aug. 1980. Commercial Sector: Baseline Energy Use – 1978. Sept. 1980. Industrial Sector: Baseline Energy Use – 1978. Oct. 1980. Transportation Sector: Baseline Energy Use – 1978. Nov. 1980.

Toledo urban area (pop. 536,000) has energy intensive industrial base; experiencing shifts from central city to suburbs. Profile, done over 18 months, employed Hittman method supplemented by small-area audits and addition of agricultural sector. Profile used as baseline to estimate potential contribution of candidate actions and to derive energy targets.

WAYNE COUNTY Michigan

Richard Grefe Associates. Wayne County Comprehensive Community Energy Management Program: Audit. Wayne County Board of Commissioners, Office of Program Development and Coordination (726 City-County Building, Detroit, MI 48226), n.d.

Includes 42 suburban Detroit communities (combined pop. 1,200,000) covering the full range of industrial, mature suburbs and the outer fringe. Profile, over 12 months, employed Hittman method with secondary data. Profile used in selection of program areas assigned to task forces and for educational purposes.

Other USA and Canadian Examples

ANAHEIM
California

California Innovation Group, Inc. Energy Management for California Cities, Volume 3: Energy Supply and Demand, Anaheim. San Jose: The Group, July 1976. 88 pp. Availability uncertain. Check with National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), or City of Anaheim (City Hall, Anaheim, CA 92805).

One of six volumes (including an energy management plan) of the Urban Energy Management Study done for the U.S. Department of Housing and Urban Development, this report explains the collection and analysis of data for present and future energy supply/demand for the City of Anaheim (pop. 225,000). The data base includes identified vulnerabilities to energy supply shortages and five scenarios to analyze future supply/demand.

BRAMPTON
Ontario

Local Energy Action Study Team. Brampton Energy Profile. Downsview, Ontario: York University, Faculty of Environmental Studies (4700 Keele Street, Downsview, Ont. M3J 2R2), April 1981. Out of print.

A first-cut profile of the City of Brampton (pop. 140,000), prepared as a classroom exercise by a team of graduate students. Includes 1980 energy use, costs, trends, indicators of energy waste, key directions for municipal action, and an appended summary of the method (based on secondary data and estimates).

CALLAWAY
COUNTY
Missouri

Swindler, Jim, et al. Callaway County Energy Study. Fulton, MO: Callaway County Energy Study (Rt. 1, Box 136, Fulton, MO 65231), Sept. 1981. 40 pp. $3.00.

Prepared for this rural county (pop. 32,400) by a group of citizens using a method adapted from the County Energy Plan Guidebook (see Okagaki and Benson, Appendix A). The study, clearly and simply presented, includes current and

projected energy supply/demand, energy attitudes, energy conservation and renewable energy potential, and recommendations for action.

CAMBRIDGE
Massachusetts

City of Cambridge, Community Development Department. Energy Use in Cambridge. Cambridge, MA: The Department (57 Inman Street, Cambridge, MA 02139), 1980. Unpriced.

Illustrates patterns of energy use and their implications (summarized in Cambridge Energy Future, n.d., free). Also provides information on energy costs, conservation potential and energy resources. Part of a wider community energy planning process.

CLARKSBURG
Virginia

InterTechnology/Solar Corporation. Development of a Comprehensive Community Energy Management Plan for the City of Clarksburg, West Virginia. Final Report. Clarksburg: The City, 1978.

Annotated in Appendix A.

EL PASO
Texas

City of El Paso, Office of Energy Conservation. Energy Use in El Paso: A Draft Final Report to the Citizens. El Paso: The Office, June 1981. Contact Office of Energy Conservation, City of El Paso (P.O. Box 1919, El Paso, TX 79999).

Part of the City's community energy planning program, financially assisted by the Texas Energy and National Resources Advisory Council, under its CCEMP. Covers transportation, industrial, residential, commercial and governmental sectors of the city (pop. 425,000). Used Hittman approach supplemented by local primary data.

FRANKLIN
COUNTY
Massachusetts

University of Massachusetts, Future Studies Program. Franklin County Energy Study: A Renewable Energy Future. Washington, DC: U.S. Dept. of Energy, April 1979. Availability uncertain; contact Franklin County Office of Energy (466 Main Street, Greenfield, MA 01301).

Develops an "energy need satisfaction scenario", for the year 2000, which relies on renewable energy resource systems, for this rural county (pop. 65,000). Current energy use was determined by apportioning state use. For further information on the energy activities of Franklin County, considered a model for rural areas, see: Michael F.C. Gery, Groundwork: Energy Planning in Franklin County (Boston: U.S. Dept. of Energy, Region I Office, 1980), available from Massachusetts Municipal Association (131 Fremont Street, Boston, MA 02111), no charge.

HILLSBOROUGH
Florida

University of Florida, Center for Wetlands. Energy Basis for Hillsborough County: A Past, Present and Future Analysis. Tampa: Hillsborough County Environmental Protection Commission (Energy Department, 1900 9th Avenue, Tampa, FL 33605), Aug. 1979. 112 pp.

Prepared by Howard T. Odum and others at the University of Florida using an "energetics" approach that takes account of energy used, embodied energy and environmental factors.

LAGRANGE
Georgia

James Wright Associates, Inc., and Sizemore and Associates. LaGrange Energy Resource Management Program. LaGrange, GA: The City (Nov. 1977).

Application of the Sizemore method (see Appendix A) to a small city (pop. 26,000).

METROPOLITAN TORONTO
Ontario

Macdonald, Robert; Desfor, Gene; and Miloff, Michael. Patterns and Levels of Commercial and Industrial Energy Consumption: A Case Study of Metropolitan Toronto. Ottawa: Energy, Mines and Resources Canada, 1979. 301 pp. Available from EMR, Conservation and Renewable Energy Branch, Communications Division (580 Booth Street, Ottawa, Ontario K1A 0E4), no charge.

A detailed profile (part of a research project, not a planning process) of energy consumption

in the commercial and industrial sectors of Metro Toronto (pop. 2,113,000); includes methods and results. A summary of transportation energy consumption is contained in: Wilbur Smith and Associates, Metropolitan Toronto Area Transportation Energy Study. Background Report I: Land Use, Transportation and Energy Relationships. (Toronto: Municipality of Metropolitan Toronto and others, Dec. 1980). Contact Ministry of Transportation and Communications, TEMP (1201 Wilson Avenue, Downsview, Ontario M3M 1J8). A community energy profile for the Borough of York, one of the area municipalities within Metro Toronto, can be found in: Gene Desfor et al, Urban Form and Energy Consumption. Final Report (Ottawa: Ministry of State for Urban Affairs, March 1979). Contact Middleton Associates (980 Yonge Street, Toronto, Ontario M4W 2J9).

OAKVILLE
Ontario

Middleton Associates. Energy Management at the Local Level. Toronto: Royal Commission on Electric Power Planning, 1978. Availability uncertain; contact Middleton Associates (980 Yonge Street, Toronto, Ontario M4W 2J9).

An energy profile, excluding the transportation sector, was part of this study that used a combination of analytic techniques and surveys. Not part of an energy planning process.

NOTRE DAME DE GRÂCE
Montreal, Quebec

Norton, Rita. Report of the NDG Community Audit Project. Ottawa: Energy, Mines and Resources Canada, 1980. 176 pp. Available from EMR, Conservation and Renewable Energy Branch, Communications Division (580 Booth Street, Ottawa, Ontario K1A 0E4), no charge.

Documents a three-month pilot project in an older residential neighbourhood (pop. 80,000) in central Montreal. The energy profile – more participative and educative than analytical – focused on the residential sector and was based on a household sample survey.

PALM BEACH COUNTY Florida

Area Planning Board of Palm Beach County. Energy Planning Base Study, Final Report. West Palm Beach: The Board (2300 Palm Beach Lakes Boulevard, Suite 200, West Palm Beach, FL 33409), June 1979. 118 pp. $5.00.

Sets out to provide an understanding of the County's energy system and to establish an energy data base; included is an energy policy analysis and a proposed energy element for the regional plan.

PORTLAND Oregon

City of Portland, Bureau of Planning. Energy Choices for the City of Portland, Oregon. Volume 1: Preliminary Energy Data and Analysis. Washington, DC: U.S. Dept. of Housing and Urban Development, Sept. 1977. 343 pp. Available from National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161), order no. PB-276779, $24.50.

Part of the Portland Energy conservation Demonstration Project, this document provides extensive information (based on secondary data) on current and projected energy use in residences, business, industry, government and transportation as well as on the impact of land use policy on energy consumption. Part of a comprehensive planning process.

REGION 2 PLANNING COMMISSION Michigan

Region 2 Planning Commission. Energy: A Regional Energy Element. Jackson, MI: The Commission (Jackson County Tower Building, 120 West Michigan Avenue, Jackson, MI 49201), June 1978. 98 pp. $4.00.

Includes a regional energy inventory and an analysis of the supply/demand situation.

RENFREW COUNTY Ontario

Energy Pathways Policy Research Group. Renfrew County Energy Conservation Project: A Community Energy Study. Ottawa: Energy, Mines and Resources Canada, 1980. 179 pp. Available from EMR, Conservation and Renewable Energy Branch (Communications Division, 580 Booth Street, Ottawa, Ontario K1A 0E4), no charge.

Energy profile of a large, sparsely populated rural municipality (pop. 86,400) in eastern Ontario. Secondary data, supplementary surveys and simple analytic techniques were used to determine overall energy consumption, fuels used, and energy use in the residential and transportation sectors; a separate section covers energy from wood. No plan or comprehensive energy actions resulted.

SALEM
Oregon

Mid Willamette Valley Council of Governments. Salem Urban Area Energy Study. Salem: The Council (400 Senator Building, 220 High Street N.E., Salem, OR 97301), March 1978. 68 pp. Unpriced.

Evaluates current and long-term energy consumption trends in the Salem Urban Area and makes policy recommendations for energy conservation. Energy costs are emphasized; current and future costs are compared with current and future earnings in each sector to estimate potential economic impacts of predicted growth in energy consumption. Energy savings targets are based on holding constant identified cost/earnings ratios.

SANTA CLARA
COUNTY
California

Northcross, Mark. Energy Use and Supply in Santa Clara County. May 1978. Future Energy Needs of Santa Clara County. May 1978. The Relationship Between Energy Use and the Economy in Santa Clara County. Aug. 1978. San Jose: County of Santa Clara, Planning Department (70 West Hedding Street, San Jose, CA 95110), no charge.

Among a series of reports prepared for the Santa Clara County Energy Task Force as part of a study to develop county-wide policies on energy conservation for inclusion in the County's General Plan. The method used secondary data supplemented by estimates.

SOUTHERN TIER CENTRAL REGION
New York

Southern Tier Central Regional Planning and Development Board. Energy Technology Assessment Workbook. Dec. 1978. $3.00. Renewable Energy Technology Assessment Workbook. Dec. 1978. $3.50. Renewable Energy Resource Inventory. Dec. 1978. $6.50. Energy Conservation and Development Plan. July 1979. $4.00. Available from The Board (53 1/2 Bridge Street, Corning, NY 14830), 1979.

Outputs of a project, one of several financed by Oak Ridge National Laboratory (Oak Ridge, TN 37830) on behalf of the U.S. Department of Energy. The planning process involved three stages: assembling a data base including both consumption and supply; citizens working independently and with local officials to develop an energy conservation action plan; and technology assessment of a planned scenario (enumeration and evaluation of second and higher-order consequences of decentralized renewable resource technology). The resource inventory is considered a good example of the supply side of a community energy profile.

Appendix C: Study Method

The study was conducted over the nine-month period July 1981 to March 1982. Its broad objective was to provide a method for municipalities to analyze energy consumption throughout the community, as a basis for preparing energy plans. Five specific tasks were identified in the contract:

1. Analyze examples of community energy profiles already undertaken.

2. Develop a method for preparing a community energy profile that is applicable to Ontario municipalities.

3. Consult with officials responsible for the U.S. Department of Energy's Comprehensive Community Energy Management Program (CCEMP).

4. Prepare a report aimed at assisting municipal officials in Ontario to conduct community energy profiles.

5. Prepare a report describing the development of the method and summarizing the CCEMP and other relevant experience.

Development of the profiling method had begun earlier, as part of a graduate class in the Faculty of Environmental Studies, York University, supervised by Professor Reg Lang. The method developed in that exercise, in the City of Brampton, was a starting point for further methodological work.* This involved:

---

* In the Winter Term 1982, another group of students tested aspects of the method, developed during this study, at the neighbourhood level in the Riverdale area of Toronto.

- Obtaining and reviewing examples of community energy profiles from municipalities in the United States and, to a lesser extent, in Canada (where few such examples exist) and in some cases communicating with those responsible for the profile, especially in the CCEMP communities as well as in Peterborough, Ontario, where an unpublished community energy profile was done in 1980.

- Visiting the Argonne National Laboratory, Environmental and Energy Systems Division (Argonne, Illinois), for in-depth discussions on the community energy auditing experience of the 16 test communities under CCEMP. Meetings with Michael Meshenberg, Wayne Pferdehirt and Rick Kron.

- For the same purpose, communication with David Berger of The Academy for Contemporary Problems (now the Academy for State and Local Government, Columbus, Ohio). ACP was responsible for the evaluation of CCEMP.

- Perusal and documentation of the extensive literature from CCEMP (Appendix A and B) and a synthesis of its experience, along with other profiling experience, to come up with the first cut at a community energy profile method based on an iterative approach to community energy management.

- Communicating with agencies that have developed or are preparing documents on community energy profiling (Argonne National Laboratory, MITRE Corporation, U.S. Department of Energy, California Energy Commission, Canada Mortgage and Housing Corporation).

- Presentation of the preliminary community energy profiling method to, and feedback from, a seminar on community energy management organized by the Ministry of Energy in Toronto, 2 October 1981.

- Conduct of a one-day workshop on community energy profiling at York University, 23 October 1981, for the purpose of exposing and testing the preliminary method. Invited to the workshop were municipal officials engaged in or contemplating community energy profiles, along with utility officials and representatives of provincial departments (a list of participants is provided at the end of this Appendix). The workshop agenda included: an

introduction to community energy profiling (Lang and Armour); an in-depth case study of the preparation of a rough profile for the City of Brampton (Lang, Armour, McCauley, Short); interpreting the profile (Lang and Armour); and using the profile in community energy management (presentation of CCEMP experience by David Berger of Academy for Contemporary Problems, and group discussion).

- Consultation with utility officials (Consumers' Gas, Union Gas, Ontario Hydro, Brampton Hydro, Toronto Hydro) and others (Statistics Canada, Ministry of Treasury and Economics, Ministry of Transportation and Communications, Transport Canada) concerning data availability problems.

- Preparation of a draft Guide to Community Energy Profiling, circulated to key officials in government and utility companies for comment; finalizing the draft Guide.

- Preparation of this report.

Participants in Workshop on Community Energy Profiling

Jane Allen, Ministry of Energy

Audrey Armour, York University, Faculty of Environmental Studies

David Berger, Academy for Contemporary Problems

Dirk Blyleven, Planning Dept., City of Mississauga

Gary Burch, Building Dept., City of Mississauga

Robert De Berardis, Planning Dept., Town of Vaughan

Sandra Emery, Engineering Dept., Town of Ajax

Gloria Fallick, Energy Coordinator's Office, City of North York

Jim Forbes, Planning Dept., City of Guelph

J. Garrity, Building Services, City of London

Barbara Hume-Wright, Ministry of Municipal Affairs and Housing

Mike Jorma, Alderman and Energy Coordinator, City of Stratford

Rick Knutson, Ministry of Municipal Affairs and Housing

Reg Lang, York University, Faculty of Environmental Studies

Dorothy Lenaric, City of Mississauga Energy Task Force

William G. Leonard, Union Gas

Alan Lyn, Auditor's Dept., City of Toronto

Dave McCauley, York University, Faculty of Environmental Studies

Judy McLeod, Planning Dept., City of Kitchener

Brian Nixon, Ministry of Municipal Affairs and Housing

Tom Ostler, Planning and Development Dept., City of Toronto

Jouko Parviainen, Ministry of Transportation and Communications

Douglas Raven, Clerk Administrator's Office, City of Burlington

Brian Reid, Building Dept., City of Stratford

Evan Rodgers, Dept. of Planning and Development, City of Oshawa

Terry Short, York University, Faculty of Environmental Studies

Nancy Singer, Energy Coordinator, City of North York

Peter Spratt, Consumers' Gas

Howard Trotman, Planning and Development Dept., City of Toronto

Raj Varma, Planning Dept., City of Windsor

Grant Whittington, Planning Dept., Town of Ajax

Glen Williams, Clerk Administrator, District of Muskoka

Glen Wood, Brampton Hydro

Copies available at $3.00 per copy, payable in advance, from the Ontario Government Bookstore, 800 Bay St., Toronto. Out-of-town customers write to Publications Services Section, 5th Floor, 880 Bay St., Toronto, Ont. M7A 1N8. Tel. 965-6015. Toll free long distance 1-800-268-7540; in Northwestern Ontario 0-Zenith 67200.

Ministry
of
Energy

Honourable
Robert Welch,Q.C.
Minister